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# The Influence Of Social Reinforcement Of The Rectilinear Dot Progression Task Performance Of Normal And Retarded Subjects

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# THE INFLUENCE OF SOCIAL REINFORCEMENT ON THE RECTILINEAR DOT PROGRESSION TASK PERFORMANCE OF NORMAL AND RETARDED SUBJECTS

by

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## PREFACE

Researchers in the discipline of Psychology have recently been focusing considerable attention on the influence of social factors as these relate to the phenomenon of mental retardation. The systemic evaluation of non-intellective factors has produced data which suggest that many of the reported retardate-normal performance differences may be due to the influence of such non-intellective factors and not necessarily to some defect in the retardate's cognitive and/or physiological structure. The research presented here was designed to assess the influence of social factors on the perceptual task performance of retardates and equal mental age normal children.

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## ABSTRACT

The present investigation was an initial attempt to extend Edward Zigler's hypothesis that institutionalized familial retardates demonstrate a higher motivation to secure adult contact and approval than do noninstitutionalized equal MA normal children to the area of perceptual functioning. The rectilinear dot progression task was employed to conduct this investigation.

Forty-five noninstitutionalized normal and 45 institutionalized retarded male subjects matched for mental age and Target Test performance scores were required to judge the rectilinearity of straight and crooked line patterns generated by the sequential illumination of four neon lamps arranged in a 4 X 4 lamp matrix. The temporal contiguity of the stimulus patterns was manipulated by the random presentation of five interstimulus intervals (0.5, 1.0, 2.0, 3.0 and 5.0 seconds) in combination with a constant presentation time (.05 seconds) for each light in the line patterns.

Three experimental conditions were employed in which the type of reinforcement dispensed to the subject during his performance was varied viz. social reinforcement, non-social reinforcement, and no reinforcement.

An analysis of the variance for correct identifications produced a statistically significant interstimulus interval main effect with all other main effects and interaction effects being non-significant. These data suggest that the application of social reinforcement did

not significantly influence the perceptual task performance of the retarded subjects and the introduction of non-social reinforcement did not facilitate the perceptual task performance of the equal MA normal subjects.

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# CHAPTER I

## INTRODUCTION

The polygenic mode of inheritance for intelligence in man has exerted an heuristic influence on the research in the field of mental deficiency. The heuristic value of this approach is demonstrated by the research efforts of Edward Zigler who, utilizing the knowledge acquired by research in the area of population genetics (Burt and Howard, 1956; Burt, 1958), espouses what has been termed the "two-group approach" to the study of mental retardation (Zigler, 1966c; Zigler, 1967a; Zigler, 1968a; 1968b).

It is the intent of the present study to further examine Zigler's hypotheses with reference to the influence of non-intellective factors on the perceptual task performance of institutionalized retardates. To accomplish this end a brief exposition of the "two-group approach" will be presented.

Zigler bases his research approach to the study of mental retardation (the two-group approach) upon the polygenic mode of inheritance for intelligence which generates theoretical distributions of intelligence scores that are congruent with the observed IQ distributions as demonstrated by Burt and Howard (1956). The first component of the "two-group approach" based on the polygenic model involves the generation of an IQ distribution resembling the normal curve having a mean of 100 IQ points with a range of from 50 to 150 IQ points (Zigler, 1966c) in accord with the Mendelian explanation of multifactorial inheritance. Since 50 IQ points appears to be the

lower limit for familial retardates, Zigler postulates that the etiology of this form of retardation (familial) reflects the same factors that determine "normal" intelligence (Allen, 1958; Gottesman, 1963; Zigler, 1966c) and therefore the familial retardate can be seen as normal where normal is defined as encompassing the entire distribution of intelligence which results from the normal manifestations of the genetic pool in a population.

The second component of the "two-group approach" consists of those retardates who have known physiological deficits. Zigler states that this group represents a distribution of intelligence with a mean considerably lower than that of the familial retardates' and these children, for the most part, fall outside the range of normal intelligence i.e., below 50 IQ points. For this reason Zigler feels that the empirical distribution of intelligence might best be represented by two curves; the first being the curve generated by the polygenic model of intelligence which yields a normal distribution (mean = 100; range 50-150) and a second curve, superimposed on the first, representing retardates (those with known physiological defects) whose intellectual functioning is the result of factors other than the normal polygenic expression of intelligence. The second curve Zigler describes as being a somewhat normal distribution with a mean IQ of 35 and a range of from 0 to 70 IQ points (Zigler, 1966; Zigler, 1967; Zigler, 1968a; Zigler, 1968b).

The "two-group approach" to the study of mental retardation

allows the possibility that the familial mental retardate is not physiologically defective or abnormal pathologically but is rather a normal individual of low intelligence. Hence Zigler states that once this position is adopted the problem of familial retardation becomes part of the general problem of developmental psychology. The "two-group approach" has underscored the prolific research endeavors of Zigler in the area of mental retardation.

## ZIGLER'S RESEARCH

A review of Zigler's investigations relating to retardation will lend greater amplification to his theoretical position. Zigler's initial research in the area of mental retardation addressed itself to the cognitive rigidity construct put forth by Kurt Lewin (1935) and later reiterated by Kounin (1941).

The viewpoint that retarded individuals were more rigid than normal individuals of the same chronological age was proposed by Lewin (1935). Support for this view was offered by Jacob Kounin (1941) who, noting the deficiencies of Lewin's (1935) satiation study, controlled for the degree of differentiation by defining it as the mental age and matching his subjects for mental age. He also controlled for what he termed motivational factors such as fear of the testing situation, low success expectancy, etc. In his study Kounin (1941) employed an older feebleminded group, a younger feebleminded group, and a normal group all matched for mental age. The tasks employed were of the satiation-cosatiation; the transfer of habit;

and the concept formation types. Koumin's (1941) data supported the view that feebleminded individuals are characterized by dynamic rigidity.

Experimental contradiction to these data was provided by Plenderleith (1956) who was unable to demonstrate significant differences between her feebleminded and normal subjects in learning an original discrimination nor in the learning of the discrimination-reversal task.

The finding that feebleminded children did not differ from normal children in learning a discrimination nor in the learning of a discrimination-reversal task prompted a further test of the Lewin-Koumin hypothesis by Stevenson and Zigler (1957). These authors employed a discrimination learning and a discrimination switching task with three groups of subjects; an older feebleminded group; a younger feebleminded group; and a normal group with the subjects being matched on mental age. Upon reaching criterion for the size discrimination task, a change was initiated so that a different sized block was now the correct choice (intra-dimensional shift). The data revealed no significant differences between the groups. In order to investigate the possibility that the switching task was too easy, the authors conducted a second study designed to test the performance of three similar groups on a more difficult switching task. The switching task difficulty was increased by requiring the groups, upon reaching criterion on part one, to switch

to a position discrimination (extra-dimensional shift; size to position) on part two. The authors concluded that even though there was a great increase in the number of perseverative responses (i.e., a response which was once correct but which was no longer correct) in the second experiment, the feebleminded groups did not differ from the normal group. Hence, the results of both experiments lent no support to the hypothesis that feebleminded individuals are more rigid than normal children matched for mental age. Stevenson and Zigler (1957) did however conclude that the degree of task difficulty exerts a direct influence on the frequency of rigid responses.

In explanation for the discrepancy between the findings of Lewin (1935) and Kounin (1941) and their own, Stevenson and Zigler (1957) suggest the factor of subject motivation. These authors note that, in their study, the subjects were required to learn two successive discriminations with minimal instructions as well as minimal interaction with experimenter, while in Kounin's (1941) study, his groups were required to perform a response in compliance with instructions (transfer of habit task). Stevenson and Zigler (1957) conclude that Kounin's findings for instruction-initiated tasks may be related to differences in the subjects' motivation to comply with instructions rather than to differences in general cognitive functioning.

A further study designed to investigate the validity of the

motivational hypothesis was conducted by Zigler, Hodgden and Stevenson (1958). Three tasks similar to two of the tasks employed by Kounin (1941) (i.e., the satiation and the switching task) were employed. The feebleminded and normal children matched for mental age were grouped according to a support and a non-support reinforcement condition. In the support condition the experimenter, after giving the instructions, continued to interact with the child both verbally (four positive statements about his performance) and non-verbally (smiles and nods). In the non-support condition the experimenter did not interact with the child after giving the instructions. These conditions were employed to test two hypotheses: the first, that the support condition would yield an increase in performance relative to the non-support condition; and second, that interaction with and approval by adults would provide greater reinforcement for the responses of the retardates relative to the normal children. The data revealed that for the retardates there was a differential effect due to the support and non-support conditions but there was no such effect for the normal children; the retardates spent more time on each of the two games as compared to the normal children; and there were no significant differences found, in terms of errors, between the retardates and the normal children. Zigler, Hodgden and Stevenson (1958) concluded that a higher motivation to secure social interaction and approval through compliance and persistence on the part of the retardates may account for what often appears to be rigid

behavior.

In comparing the above results with those reported by Koumin (1941) the authors emphasize the fact that Koumin spent a week with his retarded subjects during which time he attempted to establish rapport before the actual experimentation. The retardates were also given the opportunity to refuse to play the game whereas these two variables were not operative in his normal group of subjects since they were not afforded the pre-experimental contact nor the opportunity to withdraw from the experiment. This type of differential treatment demonstrated by Koumin (1941) introduces what could be termed "selective sampling". On this point Zigler, in a later article (1962a), stated that those retardates who eventually became Koumin's experimental subjects were those who were the most highly motivated to interact with an adult and/or those who were most compliant with the experimenter's request to participate in the games. As a result, "it would appear that Koumin's procedure constitutes a serious experimental error (p. 153)".

The suggested operation of a social motivational factor (Zigler, Hodgden and Stevenson, 1958) in influencing task performance was not restricted to familial retardates alone. Shepps and Zigler (1962) advanced the hypothesis that the "rigid" behaviors manifested by both organic and familial retardates matched for mental age reflect a heightened desire for social support and approval. The experimental task employed by Shepps and Zigler (1962) to assess this hypothesis

required the retardates to insert a marble of one color into one hole of a wooden box and a marble of another color into a second hole of the same wooden box. The investigators varied the reinforcement conditions for 20 organic and 20 familial retardates matched for mental age. Two reinforcement conditions were employed. In the support condition the experimenter made positive comments regarding task performance and in the non-support condition the experimenter attended to the retardate's performance but did not further reinforce him. The authors found that the children in the support condition played the game longer than those in the non-support condition. They also found that children in the non-support condition made significantly more errors than those in the support condition. It was concluded that the incidence of so called rigid behavior in organic retardates, as well as familial retardates, can be influenced by supportive social reinforcement.

Social Deprivation:

The motivational explanation (Stevenson and Zigler, 1957; Zigler, Hodgden and Stevenson, 1958) for the findings reported by Koumin (1941) raises the question as to why institutionalized retardates might be more highly motivated, as a group, to seek social interaction and approval than are normal individuals.

Zigler (1961) advanced the view that "rigid" behavior is a function of the greater degree of social deprivation experienced by the familial retardate. Social deprivation, as noted by Zigler,

Butterfield and Goff (1966), is a concept that is frequently employed by researchers interested in social reinforcement effects but which is often not adequately defined. In an attempt to provide a standard, objective measure of early social deprivation for retardates the authors have developed a scale which yields four component scores and which, they state, are of sufficient reliability as to justify their use as predictor variables. These scores, obtained from the social histories of the retardates, reflect the preinstitutional continuity of the child's residences, the intellectual and economic status of the family, the parental attitude toward institutionalization and the marital harmony of the family. This scale was seen as necessary as a result of the research which has demonstrated the importance of social deprivation in understanding the behavior of both normal children and familial retardates (Gewirtz and Baer, 1958a; Gewirtz and Baer, 1958b; Shallenberger and Zigler, 1961; Zigler, 1961; Green and Zigler, 1962; Stevenson and Odom, 1962; Zigler, 1962b; Shepps and Zigler, 1962; Zigler, 1963a; Zigler and Williams, 1963; Butterfield and Zigler, 1965a).

Zigler (1961) hypothesized that if the rigid behaviors demonstrated by familial retardates were a result of social deprivation then, within a retardate population, a relationship should exist between the degree of social deprivation and the amount of rigid behavior demonstrated.

In order to investigate this hypothesis Zigler (1961) conducted

a study employing 60 familial retardates matched for mental age, chronological age, and length of institutionalization. These were placed into either a high deprivation or a low deprivation group. The degree of social deprivation was determined by two experimental psychologists who, on the basis of the retardate's social history, rated each retardate on a six point scale. The final social deprivation score was an average of the ratings by the two judges (interjudge reliability correlation was .77). The task which consisted of inserting a marble of one color into one hole and a marble of another color into a second hole of an enclosed box was repetitive and monotonous and was designed to reduce, relatively quickly, the retardate's desire merely to play the game. This, the author felt, would allow the assumed difference in motivation for interaction with the experimenter to become the dominant variable in determining the retardate's performance. The data demonstrated that the more socially deprived retardates spent a greater amount of total time on the game than did the less socially deprived retardates and more frequently made the maximum number of responses for the game. Zigler concluded that these findings not only support the hypothesis that the retardate's higher motivation to interact with an adult is directly related to the degree of social deprivation which has been experienced, but they also represent a forceful contradiction to the Lewin-Kounin hypothesis which is not able to account for differences in performance between groups of

familial retardates matched for both chronological and mental age.

The possibility that behaviors considered as rigid on open-ended satiation type tasks might be the result of an enhanced effectiveness of social reinforcement, due to a greater degree of social deprivation, prompted a further study by Zigler (1963a). Sixty-four normal children and 64 familial retardates, matched for mental age, half of each group living at home and half living in an institution, were required to play Marble-in-the-Hole. Two reinforcement conditions were employed; a support condition, where the experimenter gave both verbal and nonverbal support to the subject, and a non-support condition where the experimenter, after giving the instructions, did not further interact with the subject. An analysis of total time scores revealed that institutionalized subjects played longer than noninstitutionalized subjects and that subjects in the support condition played longer than subjects in the non-support condition. In addition there was a significant differential performance between normals and retardates as a function of institutionalization i.e., institutionalized retardates spent slightly less time on the task than did institutionalized normals whereas non-institutionalized retardates spent slightly more time on the experimental task than did noninstitutionalized normals. The authors also failed to find a significant relationship between the effectiveness of social reinforcement and the length of institutionalization. They concluded that the length of institutionalization should not be employed

alone as a measure of social deprivation. The finding that institutionalized children of normal intellect played the game as long under social reinforcement as did the institutionalized retardates prompted Zigler (1963a) to conclude that these data lend further support to the hypothesis that certain rigid behaviors observed in institutionalized retardates are a product of social deprivation.

Zigler (1964), in a discussion of the effect of social reinforcers for normal and socially deprived children hypothesized that once certain objective social reinforcers become effective their absence or withdrawal should produce a state of anxiety in an individual. This state of anxiety is the motivating force for the individual in subsequent situations to perform certain responses that attempt to reduce the anxiety state. Hence, "the value of the social deprivation construct lies in the specification of a particular class of reinforcers towards which the socially deprived individual will display an increased responsivity" (Zigler, 1964; p. 238).

Institutionalization:

Zigler entertained the possibility of using the "length of institutionalization" as a measure of social deprivation but he abandoned the idea. He felt that institutionalization was not a definitive measure of social deprivation in that it could not be treated as a homogeneous entity since critical social interactions

were not constant from institution to institution. However, Zigler (1964) asserts that the length of institutionalization is a widely used index for social deprivation and deserves investigation. Zigler and Williams (1963) conducted a longitudinal investigation of the systematic change in the effectiveness of social reinforcers as a function of the length of institutionalization. Forty-nine of the 60 familial retardates tested by Zigler (1961) were retested using the same two part satiation task (Marble-in-the Hole). The social deprivation scores for this study were those computed at the time of the original testing (Zigler, 1961). Of the 49 subjects employed in this study, 26 were in the high deprivation group and 23 were in the low deprivation group. When the difference scores between the two testings (which were computed by subtracting the time spent on the original testing from that spent on the retesting) were analyzed, the low deprivation group showed a significantly greater increase for the total time spent on the retest task than that of the high deprived group. The authors interpret these data to indicate that for familial retardates who have experienced the greater amount of pre-institutional social deprivation (high deprivation group) institutional living adds relatively little to the already high motivation for social reinforcers. However, for those retardates who have had comparatively good homes (low deprivation group) the longer institutionalization produces a greater increase in the effectiveness of social reinforcers.

The authors conclude that many of the reported differences in performance between familial retardates and normals may be related to the factors of early social deprivation and institutionalization.

The influence of differing institutional social climates on the effectiveness of social reinforcers was the object of a study conducted by Butterfield and Zigler (1965a). These authors state that institutionalization is not a homogeneous psychological variable but rather refers to some vague social status and that anyone who treats institutionalization as a homogeneous entity must assume that certain critical social interactions are constant for all institutions. Butterfield and Zigler (1965a) studied two residential schools for the mentally retarded having identical admission policies. The social climate in one was described as being conducive to constructive, supportive interactions whereas the other was described as emphasizing external control and not conducive to inculcating individual responsibility. The Marble-in-the-Hole task performance data revealed that those retardates from a more depriving institutional environment were more responsive to positive verbal and non-verbal support relative to retardates from a less depriving institutional environment.

A second study was conducted by these authors to examine the possibility that the experimenter's knowledge of the difference in social climates between the two institutions was influencing the results of the first study. The two experimenters employed were unfamiliar with the social milieu of the two institutions. The experimental

task and procedure were identical to that employed in the first study. The data demonstrated that different experimenters are differentially reinforcing for different populations, however, the results of the first study were supported. Butterfield and Zigler (1965a) conclude that differing social climates result in differential performance on a satiation type task.

In summary, the weight of the evidence presented by Zigler and his associates suggests that the cognitive defect which is observable in the rigid, perseverative type of behaviors demonstrated by familial retardates may not be an inherent cognitive defect, as suggested by Lewin (1935) and Kounin (1941), but may primarily be due to the familial retardate's motivation.

It should be noted here that the motivational hypothesis does not, of itself, account for all of the findings reported by Zigler et al. (1958). For example, the compliance (motivation to interact with the experimenter) hypothesis does not appear capable of explaining the finding that familial retardates show an increase in the time spent on the second part of a two part satiation type task when both parts are played under the support condition of reinforcement. The motivation hypothesis also appears incapable of explaining Kounin's (1941) finding that familial retardates demonstrate greater difficulty than do normal subjects in switching from one sorting principle to another when requested to do so. Being aware of the limitations imposed by the motivational hypothesis in failing to explain the above discrepancies,

Zigler and his associates postulate additional non-intellective factors.

As stated earlier, once the "two-group approach" to the study of mental retardation is adopted the problem of familial retardation becomes part of the general problem of developmental psychology and non-intellective factors such as social deprivation, negative reaction tendencies, institutionalization, success expectancies, outer directed modes of problem solving, and differing reinforcer hierarchies become major focal points for research related to the understanding of the familial retardate's behavior. In order to gain a macroscopic view of Zigler's research strategy with reference to familial retardates each of the above mentioned non-intellective factors will be examined briefly (excluding social deprivation and institutionalization which were examined earlier).

Negative Reaction Tendencies:

The "negative reaction tendency" factor was offered in explanation as to why the familial retardate should show an increase on Part II of a two part satiation task when both parts are played under identical conditions of support (Zigler, 1961). Zigler hypothesizes that the institutionalized familial retardate begins the task with a greater amount of ambivalence toward the task and the experimenter than do normal children. Initially the retardate's high motivation to interact with an adult (due to prior social deprivation) is combined with a relatively high negative reaction

tendency on Part I of the task. This negative reaction tendency is postulated to be an outgrowth of both the negative encounters that institutionalized familial retardates experience in their social interactions with adults and a past history of frequent confrontations with tasks for which the retardate was intellectually not capable. In the support condition, as a function of time spent on Part I of the task, this negative reaction tendency decreases. The retardate learns his fears were not founded. As a result, whether or not he receives support on Part II of the task, he meets it with a somewhat more positive reaction tendency which when combined with his motivation level receives little interference from the decreased negative reaction tendency.

Shallenberger and Zigler (1961) addressed themselves to the task of assessing the hypothesis concerning the operation of a negative reaction tendency in institutionalized familial retardates. The two part experimental task was identical to that employed by Zigler (1961). Three pre-experimental games played under a positive reinforcement condition (all responses met with success and the subject was rewarded with verbal and non-verbal support) and a negative reinforcement condition (all responses met with failure and the experimenter noted the subject's lack of success), preceded the experimental task. All groups (familial retardates and equal MA normals) received verbal and non-verbal support during both parts of the experimental task. The results revealed that both retardates

and normals under the negative reinforcement condition for the pre-experimental games spent more time on Part II of the task than those who received positive reinforcement; that retardates who received negative reinforcement on the pre-experimental games spent more time on Part II of the task than normals who received negative reinforcement; and retardates who received positive reinforcement on the pre-experimental games spent more time on Part I of the task relative to the normals under the positive reinforcement condition. The authors submit that their negative pre-experimental condition consisted of mildly punishing events that created a wariness and reluctance in the subjects. It also represented the absence of positive social reinforcers. Hence, following the deprivation of positive reinforcement, the subjects had an increased desire to secure such reinforcement. The increase in the time spent on Part II over that spent on Part I of the task indicates that the negative reaction tendency built up by the negative pre-experimental games condition dissipates on Part I of the experimental task (which is positively reinforcing) and permits the increased desire to secure positive reinforcement (created by the deprivation in the negative pre-experimental games condition) to influence the performance on Part II of the experimental task. Shallenberger and Zigler (1961) conclude that positive and negative reaction tendencies and their relative strengths seem to be the product of particular environmental events experienced by the individual. These reaction tendencies, the

authors feel, are apparently open to manipulation and modification.

Outer-Directed Problem Solving:

The negative reaction tendency which, as stated earlier, can be viewed as an outgrowth of frequent confrontations with tasks for which the familial retardate is ill equipped intellectually to deal, has been seen as generating a cognitive style of problem solving characterized by outer-directedness. Turnure and Zigler (1964) conducted a study to test the hypothesis that the high incidence of failure experienced by retardates results in an outer-directed style of problem solving. In this study 20 noninstitutionalized familial retardates and 20 normal children, matched on MA and sex, were employed. The three pre-experimental games employed by Shallenberger and Zigler (1961) were played under two conditions: success - where the responses always met with success and the experimenter verbally and non-verbally supported the subject, and a failure condition - where the responses always met with failure and the experimenter made statements of disapproval. The experimental tasks were: The Box Game (an imitation task) and The Sticker Game (designs are made first by the experimenter then by the subject). The results revealed that for The Box Game retardates were generally more imitative than normals and following failure all subjects were more imitative than following the success condition on the pre-experimental tasks. The results for The Sticker Game confirmed those found for The Box Game. Turnure and Zigler (1964) conclude that their data confirm the hypothesis that retardates are more outer-directed in their problem solving than are

normal children of equal mental age. The finding that all subjects were more imitative following failure experiences prompted the authors to conclude that the greater outer-directedness of the retardates may be an outgrowth of life histories characterized by many failure experiences.

A furthur study designed by Butterfield and Zigler (1965b) was conducted to determine whether retardates react differently following failure experiences when compared to equal MA normal children. Thirty institutionalized familial retardates and 30 normal children, matched for mental age, were employed. The subjects were assigned to one of the following three reinforcement conditions: (i) success - supportive statements for correct responses (at predetermined times); (ii) failure - negative statements following incorrect responses (at predetermined times); and (iii) a control condition - the experimenter made no statements to the subject during the games. The two pre-experimental games used in this study were Pick-a-Card and Which-School. The experimental task was a three-choice size discrimination task. For this task the subject was required to find a marble under one of three different sized blocks whose position was randomly predetermined. A randomly predetermined partial reinforcement schedule was also employed (the subject found a marble under the correct stimulus two out of every three times that he chose the correct stimulus). The results revealed that the prior experiences of both success and failure facilitated performance for

both normals and retardates. The authors state that their findings do not support the view that success and failure differentially affect children's performance and that normals and retardates do not appear to react differently to success and failure. Butterfield and Zigler (1965b) explain that a child may satisfy many motives in a test situation and that being successful (performing the correct response) is just one of many motives. For the child to perform efficiently the success-failure orientation must become dominant. The dominance is determined by the relative position of the success motive in the "motive hierarchy" prior to the success-failure manipulation imposed upon the child in the experimental situation. Butterfield and Zigler (1965b) state that the "greater the child's intrinsic desire to win the approval of the experimenter, the greater will be the facilitating effect of the success-failure manipulations (p. 29)". To test this view the authors conducted a second study employing 32 cultural familial retardates and 32 normals for whom there were measures of the effectiveness of adult approval as a social reinforcer i.e., defined by the length of time the child played a monotonous two-part task under conditions of positive social reinforcement. The equal MA normals and the familial retardates (N = 32) were each divided into responsive and unresponsive groups each of which were further divided into a success or failure manipulation group. The procedure was the same as that used in the first study except that the subjects were not offered prizes and the neutral con-

dition was omitted. The data revealed a significant Intelligence X Responsibity X Condition interaction (with no other effects being significant) which, the authors state, indicates that for both normals and retardates the responsivity to social reinforcement influences the success and failure manipulations. For failure experiences a difference was found between responsive retardates and normals but this difference was not found for nonresponsive retardates and normals following the failure manipulation. The nature of the difference for responsive retardates and normals following failure revealed that failure did not impair the performance of the retardates but rather did not facilitate it, whereas the responsive normals following failure responded with increased effort. The authors submit two hypotheses as to why responsive retardates fail to respond in a manner similar to responsive normals following failure experiences. The first relates to arousal of competing motives which, in effect, enable the responsive retardate to deny that a failure experience has occurred. The second hypothesis states that increased effort may be a common response to failure but that this response has been more frequently reinforced for responsive normals than for responsive retardates.

In order to further assess the influence of failure experiences on the problem solving strategies of MA matched normals and retarded children, Gruen and Zigler (1968) conducted a study employing 60 middle-class normal, 60 lower-class normal, and 60 noninstitutionalized

familial retardates. Two reinforcement conditions (i.e., success - where the subjects were given a marble on 90% of the trials as well as three positive statements by the experimenter at predetermined points; and, a failure condition - where the subjects were given a marble on only 10% of the trials and three negative statements by the experimenter at predetermined points) were employed for the three experimental games. A control condition where the subjects participated only on the criterion task was also employed. Prior to the first experimental task all subjects were informed that they could obtain toys by winning enough marbles. Four tasks consisting of three experimental games i.e., Pick-a-Card; Which-School; and Drop-a-Marble, and a probability learning task (a yellow panel with a horizontal row of three circular black knobs on its face, a red light centered at the top and a hole through which marbles could be delivered) were employed. For the criterion task the correct knob was reinforced 66% of the time and the others were not reinforced. On this task two penalty conditions were introduced i.e., a non-penalty condition and a penalty condition where each time the subject pushed a knob and didn't win a marble he was required to give up one marble. The authors hypothesized that if a lowered expectancy of success due to a high incidence of failure experiences caused retardates to demonstrate maximizing behavior (the persistent choice of a partially reinforced stimulus), then children of normal intellect who have experienced relatively high amounts of failure (lower-class children)

should demonstrate the same type of behavior. An analysis of the total number of correct responses (a correct choice whether or not the subject received a reinforcer) revealed that the means for the lower-class normal and retarded groups were both significantly greater than that of the middle-class normal group. There was also a significant main effect for the penalty condition in which there was a significantly higher number of correct responses under the penalty condition than for the non-penalty condition. Gruen and Zigler (1968) conclude that the data support their hypothesis in that for middle-class children the expectancy of success is relatively high and they are "unwilling" to settle for the degree of success provided by maximizing behavior whereas the lower-class normal and retarded children have a lower expectancy of success and therefore appear more willing to employ maximizing behavior rather than a patterning approach to the problem. The failure to find any overall significant effects associated with the Preliminary Condition factor and the demonstration that for the middle-class normals the difference in the number of correct responses between the failure and success conditions was significant, prompted the authors to conclude that, unlike the middle-class normal children, the lower-class normals and retardates have expectancies that are so ingrained that the short-term experimental manipulations of success and failure have little effect on their performance for this particular type of task.

Reinforcer Hierarchy:

Another non-intellective factor postulated by Zigler and his associates relates to the difference in position of various reinforcers in the reinforcer hierarchies of familial retardates and normal children. Zigler (1966; 1968) states that a variety of experiential factors in the histories of familial retardates cause them to be less motivated to be correct for the sake of being correct whereas, for normal children, the effectiveness of attention and praise diminishes with maturity and the information that one is correct becomes inherently reinforcing. Zigler (1962a) states that the differing hierarchies of reinforcers between normals and familial retardates may account for the finding that retardates demonstrate a greater difficulty than normal subjects in shifting to a new concept on a card sorting task (Kounin, 1941). Since Kounin (1941) dispensed neither tangible nor supportive intangible reinforcement to his subjects in the fifth experiment (restructuring by classification) the possibility exists that the differential performance obtained between his two retarded groups and his equal MA normal group, in terms of the number of trials taken to switch to a new sorting principle, was a result of the reinforcement inherent in a correct response rather than to the greater rigidity of the retardates.

Zigler and De Labry (1962) conducted a study to investigate the influence of tangible and intangible reinforcers on the task performance of familial retardates, lower-class normal and middle-class

normal subjects matched for mental age. A three part card sorting task similar to Kounin's (1941) was employed. The data demonstrated that retarded and lower-class children performed more effectively when the tangible reinforcer was employed whereas middle-class children performed more effectively under the intangible reinforcement condition; under the intangible reinforcement condition middle-class normals performed more effectively than either lower-class normals or familial retardates; and when the optimal reinforcer was applied there were no differences between the groups in their ability to switch concepts.

The differential effectiveness of particular reinforcers in influencing the performance of middle-class normals, familial retardates and lower-class normals indicates that the type of reinforcer employed may account for some of the differences reported to exist between familial retardates and normals. The finding that familial retardates and lower-class normal children are not differentially influenced, in terms of their switching behavior, by tangible reinforcement suggests that their experiential histories may be similar in terms of reinforcement contingencies.

Zigler's (1962a) suggestion that the differential effectiveness of the particular reinforcer employed may have been responsible for the differences reported by Kounin (1941) for his concept switching task prompted a study by Zigler and Unell (1962). These authors, employing the card sorting task of Kounin (1941), demonstrated that

both the normals and retardates switched more readily from one sorting principle to the other when they were given a tangible reinforcer as compared to the subjects in the non-reinforced condition. Zigler and Unell (1962) discuss their findings in terms of tangible-intangible reinforcement conditions when it appears that a tangible-no-reinforcement reinforcement differentiation should have been discussed since their non-reinforced condition is clearly not an intangible reinforcement condition. The results of Zigler and Unell (1962) are not consistent with those of Koumin (1941) who was able to demonstrate a difference between normals and retardates on an identical task under a non-reinforcement condition. In explanation for this discrepancy the authors speculate that, since their normal subjects were in the upper socio-economic class, they may value tangible rewards because they have learned that the receipt of such rewards is an indicator of success whereas the institutionalized retardates (drawn largely from the lower socio-economic class) may value tangible rewards due to prior deprivation of such rewards. Hence, to give no reinforcement would not be expected to stimulate the performance of the normal subjects relative to that of the retarded group.

Praise vs Correct Reinforcers:

The differential effectiveness of verbal reinforcers in the hierarchies of middle and lower-class children was the object of an investigation conducted by Zigler and Kanzer (1962). These authors employed 20 middle and 20 lower-class children (determined by Warner's

Index of Social Characteristics), matched for CA, on a satiation type task identical to the marble dropping task of Shallenberger and Zigler (1961). Two types of verbal reinforcers were dispensed i.e., those indicating correctness - "correct" and "right"; and those indicating praise - "good" and "fine". An analysis of the data revealed a significant interaction effect between the type of subject and type of reinforcement indicating that "praise" reinforcers were more effective for lower than for middle-class children while "correct" reinforcers were more effective for middle than for lower-class children. This the authors contend can be related to the concept of a developmentally changing reinforcer hierarchy in that the effectiveness of attention and praise as reinforcers diminishes with maturity and is replaced by the reinforcement inherent in the information that one is correct. This suggests that for the subjects in the Zigler and Kanzer (1962) study the lower-class seven year old child is developmentally at a lower level than the middle-class seven year old child. This finding suggests that the efficacy of the verbal reinforcers employed with children bears some relationship to the type of child and that this relationship may be found in the experiential history of the child.

A Summary of Zigler's Research:

This review of the research conducted by Zigler and his associates reveals that institutionalized familial retardates demonstrate a higher motivation to secure adult contact and approval than do equal MA normal

children (Zigler, Hodgden and Stevenson, 1958; Shepps and Zigler, 1962; Zigler, 1962a; Green and Zigler, 1962). Institutionalized familial retardates also demonstrate a higher negative reaction tendency than do equal MA normal children possibly due to more frequent "negative" encounters with adults (Shallenberger and Zigler, 1961; Butterfield and Zigler, 1965b). Zigler's research has indicated that the motive structure of institutionalized familial retardates is influenced by their preinstitutional social history and the effects of institutionalization (Zigler and Williams, 1963; Zigler, 1963a; Zigler, 1964; Butterfield and Zigler, 1965a). In terms of "expectancy for success" institutionalized familial retardates have learned to expect and settle for a lower degree of success than have equal MA normal children (Gruen and Zigler; 1968). It has been suggested that they also employ an outer-directed mode of attacking environmentally presented problems as opposed to an inner-directed mode of problem solving (Turnure and Zigler, 1964). A summary of these findings is presented in Zigler (1966a; 1966b).

The above research findings are consistent with Zigler's (1966c; 1967; 1968a; 1968b; 1969) contention that the familial retardate can be viewed as a normal individual who has a slower and more limited intellectual development than an individual of average intellect. The fact that differences are found to exist among familial retardates and normals of comparable cognitive level (as determined by the mental age) can be explained by the developmental position which emphasizes

the systematic evaluation of the role of emotional, experiential and motivational factors. Zigler's approach takes as its central thesis the assertion that performance on experimental as well as real-life tasks is never the product of the retardate's cognitive structure alone but rather a combination of intellective (cognitive) and non-intellective (emotional, experiential and motivational) factors.

The developmental position asserts that if cognitive level (MA) is equal for normals and familial retardates then there should be no differences in cognitive functioning associated with IQ (which Zigler considers to be a rate measure relating the level of cognition achieved to the passage of time) i.e. there are no differences in formal cognitive functioning between familial retardates and normal children matched for their general level of cognition. However, as Zigler (1969) points out, a problem is raised by employing the MA as an indicator of cognitive level in that MA reflects factors other than cognitive ones and which can be wholly or partly independent with respect to the cognitive processes.

In reference to cognitive theories Zigler (1969) states that there is a tendency in mental retardation research to attribute all of the atypical behaviors exhibited by retardates to their cognitive inadequacy. However, cognitive theories cannot be complete theories of retardate behavior since retardate behavior, like that of any other group of humans, reflects factors other than cognitive factors, i.e.

experiential, emotional and motivational. Zigler (1969) notes that a concern with non-intellective factors is necessary since they indicate what must be controlled or at least considered before the research will permit us to assert differences in cognitive (intellective) functioning between familial retardates and normal children.

## SOCIAL REINFORCEMENT

A recurring theme which underscores the research efforts of Zigler and his associates, as indicated in the foregoing exposition, has been the importance of a variety of non-intellective factors as determinants in the task performance of familial retardates. As such, Zigler feels that for an understanding of the behavior of familial retardates it is not necessary to employ constructs other than those postulated to account for the behavior of normal individuals. At this point let us consider the influence of social reinforcement.

Zigler (1963b) advanced the view that social reinforcement, broadly defined, is a central construct for the understanding and prediction of behavior in children, (familial retardates and normals alike). Zigler (1963b) asserts that a child will experience particular environmental configurations in accord with his level of cognitive development and his gross experiential history prior to his encounter with the particular configurations. The broad definition of social reinforcement referred to by Zigler (1963b) includes attention, human proximity, smiles, nods and verbal comments of various kinds. These stimuli are conceptualized as members of a

common class since when they follow a child's response they increase the probability of occurrence of the response, increase its rate of emission or its amplitude.

The demonstration that social reinforcers strengthen responses does not provide an answer as to why this should be the case. Stevenson (1965), in an examination of the experimental variables related to social reinforcement and child behavior, was able to isolate some hypotheses which attempt to account for the reinforcing effects of social reinforcers, more specifically, adult approval. A brief recounting of these hypotheses follows.

The first hypothesis, the social deprivation hypothesis, is related to the work of Gewirtz and Baer (1958 a,b) which concerned itself with the effects of short periods of social isolation on task performance. These authors noted that social reinforcement was most effective following deprivation (a 20 minute period of social isolation prior to the task) and least effective following satiation (a pre-test period of supportive social reinforcement) and they tentatively concluded that social reinforcers follow the deprivation - satiation model. The findings of Stevenson and Odom (1962) relating to general sensory deprivation tend to support the social deprivation hypothesis.

An arousal hypothesis was offered by Walters and Ray to account for the increased susceptability of children to social reinforcers following isolation. Stevenson (1965) notes that these authors de-

monstrated that the influence of a potentially anxiety-invoking experience (being escorted to the experimental room by a strange, noncommunicative adult) produced more responsiveness to social reinforcement on a marble dropping task irrespective of whether the child had been in the isolated or the free play pre-experimental condition. Walters and Ray (1960) conclude that the effectiveness of social reinforcement is increased by social isolation only when isolation serves as an anxiety provoking event.

Stevenson (1965) reports a third hypothesis (the frustration hypothesis) based on the work of Hartup and Himeno (1959) which asserts that the disruption of an interaction between an adult and a child i.e., social isolation and/or inconsistent nurturance, should frustrate the child's dependency behavior and social reinforcement (praise and/or support) should have the effect of reducing this frustration. Hence, the frustration produced by the isolation should increase the effectiveness of the social reinforcer. However, when the person who dispenses the social reinforcement is the person who frustrates the child the frustration tends to decrease the effectiveness of the social reinforcement as demonstrated by Cairns.

Stevenson (1965), as a fourth point, lists an informational hypothesis based on a paper presented by Cairns which states that the increased effectiveness of social reinforcers following deprivation could be due to such reinforcers having increased informational value following isolation than when these reinforcers are presented in casual

play-type settings.

The fifth hypothesis, postulated by Stevenson and his associates, suggests that social reinforcement may have two different functions i.e., (i) it may reduce anxiety in a tense situation thus reducing the rate of response or (ii) it may reinforce performance when there is a less tense setting. Stevenson and Hill (Stevenson, 1965) conducted a study in which children performed on one of two pairs of formboard-like puzzels, one pair easily assembled and the other pair extremely difficult to assemble. Following success or failure on the puzzels the children were then tested on the marble dropping task in which half the children received social reinforcement and the other half did not. The data demonstrated that for the success-reinforced group there was a greater increase in response over the success-nonreinforced group. This is in keeping with the idea that social reinforcers increase responses in less tense situations i.e., the success condition. For the subjects in the failure condition the failure-reinforced group demonstrated a lower rate of responding relative to the failure-nonreinforced group. This is in keeping with the response reducing function of social reinforcers in tense situations.

It appears that a salient feature of the above hypotheses is the factor of anxiety (save for the possible exception of the informational hypothesis). Social reinforcement, it seems, may serve to reduce the anxiety created by or correlated with various settings

and/or events through imparting reassurance and support to the individual.

Wiener, Crawford and Snyder (1959) employing male institutionalized familial retardates report that poor achievement, as measured by the Wide Range Achievement Test, was significantly related to a high test anxiety level but not to a high general anxiety level. Malpass, Mark and Palermo (1960) report that institutionalized retardates demonstrate a higher level of anxiety, as measured on the Children's Manifest Anxiety Scale (CMAS), relative to noninstitutionalized retardates and that the two groups of retarded children demonstrated significantly higher CMAS scores relative to a control group comprised of CA matched normal children. Knights (1963), in an investigation of the level of test anxiety and defensiveness in normal and retarded subjects demonstrated that, for retarded children in or out of an institution, the level of test anxiety is higher than that of normal children. Zigler (1964) states that once certain objective social reinforcers become effective their absence or withdrawal should result in a state of anxiety and it is this state of anxiety that motivates the individual in subsequent situations to respond in a manner that will lead to a reduction of the anxiety state.

The indication that familial retardates might have higher levels of anxiety relative to normals (Zigler, 1966c) says little about the ontogenesis of anxiety in retardates. Nonetheless, anxiety,

whether it be the result of social deprivation, lower generalized expectancy for success, positive and negative reaction tendencies or any other component of the retardate's experiential history, renders the familial retardate sensitive to social reinforcement and may be responsible for certain of the reported task performance differences between retardates and MA matched normal subjects.

Social Reinforcement and Type of Task:

In order to demonstrate the influence of social reinforcement on the behavior of familial retardates the experimenter should select a task that is sensitive to the effects of that variable. Stevenson (1965) states five criteria that he considers necessary if an experimental task is to be effective in assessing the influence of social reinforcement.

These are:

1. The task must not possess high intrinsic interest if the effects of social reinforcement are to be maximized.
2. The task should not have a clear terminus or a visible product.
3. The task should minimize the effects of earlier learning.
4. The task should permit the adult to dispense supportive comments arbitrarily.
5. The task should utilize discrete responses. (p. 99)

A task which Stevenson (1965) feels meets these criteria is the marble dropping task. He describes it as an endless, dull task which requires

minimal prior learning, uses discrete responses and has no clear criteria for adequate performance.

A majority of the studies conducted by Zigler and his associates, designed to investigate the influence of social reinforcement, have employed the marble-dropping or similar type tasks (Zigler, Hodgden and Stevenson, 1958; Zigler, 1961; Shallenberger and Zigler, 1961; Green and Zigler, 1962; Zigler and Williams, 1963; Butterfield and Zigler, 1965a; Gruen and Zigler, 1968). It would seem that Zigler's experimental task is an adequate vehicle for assessing the influence of social reinforcement in terms of the criteria delineated by Stevenson (1965). The dependant measure employed by a majority of the studies conducted by Zigler and his associates i.e., time spent at the task, has also been cited as an appropriate measure to determine the effectiveness of social reinforcers (Parton and Ross, 1965).

## HOLDEN'S RESEARCH

If, as Zigler has repeatedly demonstrated, the performance of familial retardates can be ameliorated by the introduction of supportive social reinforcement on open-ended satiation type tasks, then it remains to be demonstrated that Zigler's approach is viable for tasks other than those mentioned thus far. A test of this deduction, the central focus of this thesis, will be the attempt to influence the performance of institutionalized retardates on a perceptual task which has previously been employed (Holden, 1967; 1968;

1969) to assess the stimulus trace deficit position (Ellis, 1963). A brief exposition of the theory proposed by Ellis (1963), who postulated the stimulus trace as an explanatory mechanism to account for the behavioral inadequacy of mentally defective humans, will be presented.

In his molar approach to short-term memory deficits in subnormal humans Ellis (1963) postulates two constructs: the stimulus trace and central nervous system integrity. The stimulus trace construct is related to the idea of a reverberatory circuit being produced as the result of the perseverative after effects of stimulation. This is paralleled in neurophysiological theory by the Hebb-Milner cell assembly hypothesis. Ellis (1963) states that the stimulus trace "is defined antecendently by an environmental stimulus event and consequently by a behavioral event (p. 138)". The stimulus trace parameters are dependent upon stimulus characteristics such as intensity, duration and the receptor stimulated as well as upon complex dimensions such as meaning. The neural integrity construct is conceptualized as the determinant of the nature of stimulus trace activity and is defined by measures of adaptability e.g. the intelligence test score. The neural integrity thus serves to delimit or restrict the stimulus trace activity. "The central hypothesis is that the duration and amplitude of the stimulus trace activity are diminished in the subnormal organism (p. 138)". Ellis (1963), in support of his theory, cites findings from many studies involving

short-term retention phenomena such as social learning, delayed reaction tasks, reaction time, and EEG investigations.

One particular series of studies designed to investigate the stimulus trace deficit theory was conducted by Edward A. Holden Jr. For these studies a task was devised which required the integration of temporally and spatially distributed components of familiar visual patterns. This integration depended upon the simulanteous persistance of traces from all stimulus characteristics. The familiar visual patterns were produced by successively illuminating a sequence of neon lamps on a 9 X 9 lamp matrix where the lamps were spaced one inch horizontally and vertically.

Holden (1965) hypothesized that: (i) for all temporal separations between the stimulus components of the visual patterns the retardate and equal MA groups will do more poorly than the equal CA group due to a lower trace amplitude; (ii) with increasing temporal separations all groups will do more poorly; and (iii) the performance deterioration will be more rapid for the retardate and equal MA groups relative to the equal CA group due to a shorter trace duration. In the first study, Holden (1965) employed three groups: 32 educable retardates; 32 normals matched for mental age with the retardate group; and 32 normals matched with the retardate group on chronological age. Each group was divided into a short interval (.05; .10; .20; .50; 1.0; and 2.0 seconds) group and a long interval (.50; 2.0; 3.0; and 5.0 seconds) group, the intervals being the time between

offset and onset of successive lights in the patterns. In all patterns each lamp remained illuminated for .05 seconds. Holden's results revealed that for all interstimulus intervals the retardates and equal mental age normals scored a lower number of correct pattern identifications when compared to the equal chronological age normals and that all groups demonstrated a decreasing number of correct pattern identifications with increasing temporal separations (increasing interstimulus intervals). The results, however, failed to support the hypothesis that, with increasing interstimulus intervals, the retardate and equal mental age normal groups would demonstrate a greater performance decrement when compared to the equal chronological age normal group. The retardate group failed to show an earlier performance deterioration relative to the equal chronological age normal group. This prompted Holden to speculate that IQ and chronological age influence initial trace amplitude while chronological age alone determined the perseveration of the stimulus trace.

Holden (1966) designed a further study to test his conclusion that stimulus trace duration is positively related to chronological age independently of IQ. In this study the time between the onsets of successive lights was fixed at 3.05 seconds and each light remained on for .05, .20; .50; 1.0; 2.0 and 3.0 seconds. Three groups similar to those employed in the 1965 study were compared for task performance on visual pattern identification (Holden, 1965). The results generally suggested that as the stimulus duration decreased

from 3.0 to .05 seconds there was a concomitant reduction of the trace maintained by each light which resulted in the more rapid decay of traces between consecutive lights at lower levels. Specifically the data supported the hypothesis that trace amplitude deficiency in adolescent retardates is greater than in equal mental age normals. The data did not, however, support the view that trace duration is a positive function of chronological age and independent of IQ. On the basis of these findings Holden concluded that stimulus trace duration is not an independent process but rather depends upon both IQ and chronological age.

In an attempt to determine the relationship between displacement (the apparent displacement of lights about their actual progression lines) and interstimulus interval, Holden (1967) designed a task in which light stimuli were illuminated successively, one at a time, in straight line sequences. Holden (1967) employed three groups similar to those in his previous studies. The task employed required a low level of organization relative to that required by the task in the previous studies (1965; 1966) in that the visual patterns consisted of simple straight linear progressions and, as such, it was considered to provide a relatively pure measure of stimulus trace. The task required the subjects to judge the rectilinearity of straight line patterns generated by the sequential illumination of four lamps from a 4 X 4 lamp matrix. Holden (1967) hypothesized that: (i) increasing the interstimulus interval will

decrease the number of correct responses; (ii) stimulus duration (independent of interstimulus interval) will not influence correct responses; (iii) for all interstimulus intervals the number of correct responses for retardates will be lower than for equal MA normals; (iv) the retardates and equal MA normals will demonstrate a more rapid performance decrement relative to the equal CA normals; and (v) the number of straight responses will be greater for a less redundant series of stimuli.

In the first experiment the stimulus duration was .05 seconds and the interstimulus intervals were .05, 1.0, 2.0, 3.0, and 5.0 seconds. Each of the three groups was split into a Single Line and a Multiple Line condition. In the second study the time between onsets of successive stimuli was fixed at 3.05 seconds and the interstimulus interval was varied by varying the stimulus duration. The Multiple Line condition was employed in this experiment using four different stimulus durations: .05, 1.0, 2.0, and 3.0 seconds with four resultant interstimulus intervals, i.e. 3.0, 2.05, 1.05, and .05 seconds respectively. The data supported Holden's contention that: (i) the degree of trace continuity decreases with increasing interstimulus intervals (temporal separation of the lights); (ii) temporal summation does not serve to facilitate trace amplitude or poststimulus trace perseveration (i.e. the relationship between displacement and interstimulus interval is independent of stimulus duration); (iii) the lack of differences between the groups as to the

number of "straight" responses suggested that there was no difference in trace amplitude and that the differences noted in the two previous studies (Holden, 1965; 1966) may have been due to some characteristic necessary for organizing discrete stimuli into meaningful form; (iv) in the Multiple Line condition the retardates showed significantly greater trace discontinguity with increasing interstimulus intervals which may reflect a less stable poststimulus trace for these subjects; and (v) the closer proximity between eye fixation points and stimulus loci facilitates the perception of the spatial relationship between stimuli.

Holden (1968) undertook a further study to investigate the relationship between stimulus duration and trace perseveration when the interstimulus interval was held constant. The task was identical to that of the previous study (Holden, 1967). The subjects in this study were 28 educable retardates 16 of whom were assigned to a constant interstimulus interval (CI) condition. Half of these received a one second interstimulus interval and the remainder a three second interstimulus interval. Twelve subjects were assigned to the variable interstimulus interval (VI) condition defined by interstimulus intervals of 3.0, 2.05, 1.05, and .05 seconds which varied throughout the 40 test trials. The data failed to support the hypothesis that increasing stimulus duration (with interstimulus held constant) will increase performance on the task which, Holden (1968) states, is inconsistent with Ellis' (1963) notions that trace

duration is dependent upon stimulus duration. However, the data did support the hypothesis that for any stimulus duration the level of performance will be higher for shorter interstimulus intervals.

According to Ellis (1963) "with equal stimulus events for two organisms, one normal and the other subnormal, the duration of stimulus control will be longer for the former. Also the duration of stimulus control in the two organisms may depend differentially upon properties of the stimulus, i.e. there may be an interaction between the organisms and, for example, the intensity of the stimulus as reflected in duration of stimulus control (p. 139)". Holden (1969), on the basis of the above statement, hypothesized that: (i) task performance should increase directly as a function of stimulus intensity; (ii) retardates and equal MA normals should demonstrate fewer correct responses relative to an equal CA normal group; and (iii) there should be a decreased disparity between retardates, equal MA normals and equal CA normals since increased stimulus intensity should result in a relatively greater duration of stimulus control. To test these hypotheses Holden (1969) designed a study in which the stimulus intensity was varied (.22, 1.0, 5.2, and 41 foot candles). All lamps in the sequences were illuminated for 0.1 seconds and the interstimulus interval was held constant at 3.0 seconds. The data revealed that for the 10 different line sequences in the task (Holden, 1967) the trace parameters appear to be independent of stimulus intensity.

Summary of Holden's Research:

Holden's research dealing with visual pattern recognition was carried out to test the Ellis (1963) hypothesis that the duration and amplitude of the stimulus trace are diminished in the subnormal organism (mental defectives and young children). Holden's original studies (1965; 1966), which required the subjects to identify numbers, letters, and other dot patterns, were consistent with the view that both the amplitude and duration of the stimulus trace were deficient in retardates and young children (Ellis, 1963). However, when Holden (1967; 1968; 1969) changed his task to one which required his subjects to judge the rectilinearity of straight line patterns generated by sequentially illuminated lights, he demonstrated that varying the stimulus duration and intensity did not produce the behavioral differences that were obtained in the original two studies. He was able, however, to demonstrate that for any stimulus duration the performance level was inversely related to the interstimulus interval and this phenomenon held up throughout the entire series of studies suggesting that stimulus trace parameters may not necessarily be related to stimulus characteristics "per se" i.e. intensity, duration, etc. but rather to the temporal contiguity of the stimulus components.

## PURPOSE OF PRESENT RESEARCH

Holden (1967) was able to demonstrate that for educable retardates and equal MA normals there was a differential effect due to increasing the interstimulus interval in that the deterioration in

performance for the educable retardates was significantly more rapid than that of the equal MA normals. As such, Holden (1967) reported that this finding was "... within the context of Ellis' (1963) stimulus trace theory (and) may reflect a less stable poststimulus trace for this group (retardates) compared with equal CA and MA normals (p. 370)". Since Holden (1967) did not dispense reinforcers (tangible, intangible, verbal) during the task performance of his subjects it is hypothesized that the no reinforcement retardate and equal MA normal groups in the present study will demonstrate task performance scores similar to those of Holden's (1967) educable retardate and equal MA normal groups.

The major purpose of the present study is to investigate the possibility that non-intellective factors may account for the reported perceptual task performance differences (Holden, 1967) between retardates and equal MA normals. In particular, this study constitutes an investigation of Zigler's hypothesis that institutionalized retardates demonstrate a higher motivation to interact with supportive adults relative to non-institutionalized equal MA normal children due to a greater degree of pre-institutional social deprivation. The task selected for this study was the perceptual task designed by Holden (1967). In order to test the hypothesis that institutionalized retardates have a higher motivation to interact with a supportive adult an experimental condition (social reinforcement) will be employed whereby supportive comments, spoken by an adult, will be made contingent upon correct responses. A second experimental

condition (non-social reinforcement) will employ the mechanical (recording tape) reproduction of statements indicating the correctness of the response and a third experimental condition (no reinforcement) will consist of no reinforcement subsequent to the subject's responses. It is hypothesized that the task performance of the retardates relative to that of the equal MA normals will be significantly better under the social reinforcement condition in relation to the non-social reinforcement and no reinforcement condition performance scores.

The non-social reinforcement condition should facilitate the performance of the equal MA normals relative to that of the retardates due to the demonstration that middle-class children respond more effectively to "correct" reinforcers than to "praise" reinforcers (Zigler and Kanzer, 1962). Since familial retardates are predominantly from lower-class socio-economic backgrounds (Zigler, 1966b) they should respond more favorably to "praise" reinforcers than to "correct" reinforcers. In keeping with the findings of Zigler and Kanzer (1962) the equal MA normals in this study should respond more effectively to "correct" reinforcers since these children were selected from geographically middle-class residential areas. Accordingly, it is hypothesized that when the social reinforcement, non-social reinforcement, no reinforcement comparisons are made there will be a differential effect on group performance as a function of the type of reinforcement dispensed with the equal MA normals yielding a significantly better performance under the non-social reinforcement condition relative to the performance of the retardates.

# CHAPTER II

## METHOD

### Subjects

In the present study male subjects (Ss) and a male experimenter (E) were employed in order to demonstrate the differential effectiveness of three experimental conditions viz. social reinforcement; non-social reinforcement; no reinforcement; on the perceptual task performance of institutionalized retardates and equal MA normals. The literature relating to the effectiveness of social reinforcers (i.e. statements such as "that's very good"; "you're really good at this game"; "you're doing very well"; "that's fine"; "good") as a function of the sex of S and the sex of E (Gewirtz and Baer, 1958a; Stevenson, 1961; Stevenson and Knights, 1962b; Stevenson and Allan, 1964) indicates a cross-sex effect. Social reinforcement delivered by female Es was found to be more effective with boys than with girls and social reinforcement delivered by male Es was found to be more effective with girls than with boys. The present study was designed to eliminate the influence exerted by the cross-sex effect on the social reinforcement groups by employing male Ss and a male E. This procedure provides a more stringent test of the effect of social reinforcement since it reduces the advantage afforded by the cross-sex effect.

The retarded children were drawn from the male populations of

the Ontario Hospital School, Cedar Springs; the Midwestern Regional Children's Center, Palmerston; and the Ontario Hospital School, Orillia. The selection criteria applied to the retardate sample were as follows:

(i) Ss must be enrolled in the academic program of their respective institutions.

(ii) Ss must have received a score of 50 IQ points or better on an individual standardized intelligence test as determined by the psychological report in their respective case books.

(iii) Ss must be free of gross sensory, motor and/or psychological impairment.

(iv) The pregnancy must have been "normal" i.e., no heavy bleeding; eclampsia; or other physiological problems, as determined from the clinical abstract.

(v) The delivery must have been uncomplicated i.e. no report of mechanical injury; cyanosis; or other physiological problems as determined from the clinical abstract. Prematurity was acceptable provided that there was no stated relationship between the prematurity and the retardation in the clinical abstract or case conference report.

(vi) Those Ss with a history of brain injury and/or infection were not included in the sample.

(vii) Ss were required to have electroencephalograms "within

the normal limits for age" or "slightly abnormal" and no history of seizures. The acceptability of the EEGs was based on the EEG report found in the case books.

(viii) The AAMD classification number (Heber, 1959) was employed to rule out those Ss with evidence to suggest organic involvement: (e.g. 50-Neurofibromatosis; 11.2-Rubella; 42-Phenylketonuria; 64-Down's Syndrome).

On the basis of these selection criteria, 41 potential Ss were selected from the Ontario Hospital School, Orillia; 29 potential Ss were selected from the Ontario Hospital School, Cedar Springs; and 4 potential Ss were selected from the Midwestern Regional Children's Center, Palmerston.

AAMD Classification:

Each of the 45 retarded children eventually selected as Ss for this study on the basis of the Peabody Picture Vocabulary Test MA and the Target Test matching criteria were diagnostically classified according to one of the following AAMD major Etiological Classifications (Heber, 1959):

CODE VIII - Mental Retardation Due to Uncertain (or Presumed Psychologic) Cause with the Function Reaction Alone Manifest.

81 - Cultural familial mental retardation (N = 25).

82 - Psychogenic mental retardation associated with environmental deprivation (N = 5).

89 - Mental retardation other due to uncertain cause with the functional reaction alone manifest (N = 10).

CODE VI - Mental Retardation Associated with Diseases and Conditions Due to Unknown Prenatal Influence.

61x - Cerebral defect, congenital. Not further specified. (N = 3).

CODE (00) - Normal (N = 2).

A chi square analysis was performed on the Institution X Major Etiological Classification ( 3 X 5 ) contingency table. The obtained $X^2 = 9.96$ failed to reach the required value for significance at the .05 level for 8 d.f. thus suggesting a non-significant relationship between the particular institution and the various major etiological classifications assigned by the institutions to the retarded Ss.

A second chi square analysis was carried out on the Experimental groups X Major Etiological Classification ( 3 X 5 ) contingency table. This obtained $X^2 = 12.45$ also failed to reach the required value for significance at the .05 level for 8 d.f. which suggests a non-significant relationship between the experimental groupings and the major etiological classifications found in the 45 retarded Ss.

For the retarded Ss Pearson Product Moment Correlation Coefficients were computed for the PPVT IQ scores obtained by E during

the selection procedure and the individual standardized IQ test scores found in the case books of the respective Ss. For the present retardate sample (N = 45) the various individual standardized IQ tests employed were: the WISC (N = 28); the Stanford-Binet, Form L-M (N = 10); the WAIS (N = 5); and the Khulman (N = 1). One retardate was classified as "mild" but the IQ test was not stated in the report. The correlational analysis for the Full Scale WISC and the PPVT IQ scores produced an $r = .246$ (not significant). The Stanford-Binet and PPVT pairing produced an $r = .886$ ($p < .01$) and the WAIS - PPVT pairing produced an $r = .834$ ($p < .02$).

The normal children were drawn from two public elementary schools located in London, Ontario viz. Kensal Park Public School and Woodland Heights Public School. The selection criteria for the normal S sample were as follows:

(i) Ss must be enrolled in the academic program of the school.

(ii) Ss must not be taking medication on a continuing basis as determined by the school principal.

(iii) Ss must not be repeating their present grade.

(iv) Obvious behavior problem children were excluded.

Ten male names were selected by E from the alphabetical class lists of grades one to eight in each school. Parental permission for the child to participate in the study was obtained by letter. If the child was taking medication, was an obvious behavior problem or repeating the grade, the principal cautioned E and the name was dis-

carded. Permission was obtained for 69 pupils from Kensal Park Public School and 74 pupils from Woodland Heights Public School.

Each child in the retardate sample (N = 74) and in the normal sample (N = 143) was tested individually using the Peabody Picture Vocabulary Test (PPVT), Form A (Dunn, 1959) and the Target Test (Reitan, 1959), in sessions requiring approximately 17 minutes. A retardate-normal yoked matching procedure was employed using the mental age (MA) scores obtained on the PPVT ($\pm$ 3 months) and the scores on the Target Test ($\pm$ 2 correct). The retardate-normal yoked matching procedure resulted in 45 matched pairs of Ss.

Design: In the present study three experimental conditions were employed viz. a no reinforcement, a social reinforcement, and a non-social reinforcement condition. The 45 retardates were divided equally into three groups and each group was randomly assigned to one of the above experimental conditions. The normal Ss were assigned to their respective experimental conditions in accord with their yoked retardate matches. The mean PPVT MA, Target Test scores, chronological age (CA) and PPVT IQ scores for the six experimental groups are presented in Table 1.

The between group comparisons for normals and retardates on the PPVT MA and Target Test scores revealed no significant differences. Analyses of variance also revealed no significant within group differences for normals and retardates on the PPVT MA, Target Test scores, CA and the PPVT IQ.

TABLE 1

Mean PPVT MA, Target Test Scores, CA, and

PPVT IQ Scores for the Six Experimental Groups

| Group | Condition | PPVT MA (in years) | | | Target Test Scores | | CA (in years) | | PPVT IQ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | N | $\bar{X}$ | SD | $\bar{X}$ | SD | $\bar{X}$ | SD | $\bar{X}$ | SD |
| Normal | No Reinforcement | 15 | 9.53 | 2.38 | 14.40 | 2.67 | 8.40 | 1.54 | 108.00 | 12.22 |
| | Social Reinforcement | 15 | 9.63 | 2.07 | 13.97 | 3.78 | 8.73 | 1.69 | 106.73 | 13.51 |
| | Non-Social Reinforcement | 15 | 9.77 | 2.17 | 13.57 | 3.60 | 8.06 | 1.61 | 112.60 | 14.68 |
| Retarded | No Reinforcement | 15 | 9.58 | 1.98 | 14.27 | 3.18 | 15.12 | 2.53 | 72.67 | 9.50 |
| | Social Reinforcement | 15 | 9.61 | 2.06 | 14.00 | 3.72 | 16.34 | 1.99 | 69.80 | 8.46 |
| | Non-Social Reinforcement | 15 | 9.75 | 2.13 | 13.70 | 3.78 | 15.35 | 2.28 | 72.40 | 9.65 |

## TEST MATERIALS

The Peabody Picture Vocabulary Test (PPVT), Form A (Dunn, 1959) was individually administered to each S in order to obtain an estimate of the mental age. This procedure for obtaining an estimate of mental age has been employed by many researchers in the area of mental retardation (e.g. Balla and Zigler, 1964; Butterfield and Zigler, 1965; Gruen and Zigler, 1968; Sanders, Zigler and Butterfield, 1968). In employing the MA match procedure the assumption is that E equates the groups on some fundamental intelligence dimension, however, Baumeister (1967) cautions that MA is a composit which normally reflects the operation of a variety of factors. Both Zigler (1969) and Baumeister (1967) agree that the MA is not a "pure" measure of developmental level since MA reflects the operation of a variety of factors. The MA match procedure may, for one group, prove to be highly related to the criterion measure while for another group it may prove to be unrelated to the criterion measure. Although Baumeister (1967) raised this criticism for MA ratings that are composits of an equal number of verbal and performance items on a test (e.g. Stanford-Binet Form L-M) it is also valid for the MA obtained from tests such as the PPVT which reflect ability in one rather specific area. Therefore, since the PPVT is a highly verbal task and the experimental task is related to visual spatial memory (non-verbal) E introduced the Target Test (Reitan, 1959).

The Target Test is a test of visual memory which requires

visual and spatial abilities (Reitan, 1964; Knights and Watson, 1966; Klonoff, Robinson and Thompson, 1969). The examiner taps out a pattern on an 18 X 18 inch square white poster board upon which are located nine black dots (1 inch in diameter) arranged in a 3 X 3 square with 6.25 inches between their centers. The S is seated approximately 4 and one half feet from the face of the sheet which is situated slightly above eye level. The subject has before him a paper with 20 boxes drawn on it, each box being a smaller reproduction of the sheet on the wall. After the examiner taps out a pattern, he waits 3 seconds and then says "Go" at which time S must draw the pattern in the correct box on his paper. The subject must join the dots in the same order as the examiner tapped them. The test is discontinued after four consecutive mistakes or after S has completed the 20 patterns. The S's score is the number of patterns correctly drawn.

The Target Test (Reitan, 1964) was employed in order to match the normals and retardates on a non-verbal performance task. It was noted that Holden's (1967) equal MA normal and retardate differences might be due to pre-existing differences in the visual spatial abilities of his groups. Therefore the Target Test was employed as a matching criterion in the present study to insure a comparable level of visual spatial abilities between the groups. It was felt that matching the normal Ss and the retardates according to their Target Test performance scores would equate these two groupings on a variable highly related to the criterion measure, a procedure suggested by

Baumeister (1967).

In order to obtain an estimate of the social position occupied by the parents of the Ss in the present study the Two Factor Index of Social Position (Hollingshead, 1957) was employed. For this scale the two factors utilized to determine social position are occupation and education. The occupational scale is premised upon the assumption that different values are attached to different occupations by members of our society. This produces a hierarchical structure ranging from the low evaluation of unskilled physical labour (which, on the scale receives a score of 7) to the more prestigeful use of skill, i.e. Judges, Research Directors, Bank Presidents (which, on the scale receive a score of 1). The educational scale is divided into seven positions with those individuals who complete fewer than seven years of education receiving a score of 7 while those persons who obtain a graduate degree receive a score of 1. The scores obtained on each scale are then combined after weighting the individual scores (the weights being obtained by multiple correlation techniques) to obtain the Index of Social Position score. The social class position is determined by the location of the Index of Social Position score in a hierarchy of scores divided into 5 social classes by Hollingshead (1957).

A scale developed by Zigler, Butterfield and Goff (1966) was employed to obtain a gross measure of the nature of the retarded Ss' interactions with the most significant adults in their preinstitutional lives. The information required for the completion of this scale

(Social Deprivation Scale) was obtained from the case books of each retardate. The authors describe the scale scores obtained as reflecting the preinstitutional continuity of the S's residences, the parental attitude towards institutionalization, the intellectual and economic status of the family, and the marital harmony of the family.

## APPARATUS

The experimental task employed is a modification of the task designed by Holden (1967). For a technical description of the apparatus see Appendix B. On this task Ss are required to judge the rectilinearity of straight and crooked line patterns generated by the sequential illumination of four neon lamps (NE-2s) arranged in a 4 X 4 lamp matrix. These lamps are embedded in one quarter inch holes drilled through three quarter inch plywood and spaced horizontally and vertically with 1 inch between their centers. The stimulus display lamp matrix is covered with translucent black muslin cloth through which the unilluminated lamps cannot be seen. The black stimulus display screen which houses the lamp matrix measures 8.75 X 12.50 inches and is supported by an attached stand which rests on a table. The room illumination is provided by a 60 watt incandescent lamp located behind and to the left of S at a height of 5 feet 10 inches from the floor.

The selection of the lamp sequences and the interstimulus intervals is effected by a pre-wired stepper relay which presents the 50 test sequences automatically and provides an intertrial interval of 8 seconds. The 50 straight and crooked line sequences and the 5

interstimulus intervals were selected randomly for the 50 trials and these remained constant on each trial for each S in the study.

The apparatus was designed to provide a pre-test phase consisting of eight four lamp sequences. The eight sequences in this phase (four straight and four crooked) consisted of four lamps which were illuminated simultaneously for as much time as S required to determine whether the four lamps formed a straight or a crooked line. These eight pre-test sequences were switched manually by E.

A buzzer automatically signalled the start of each sequence for the 50 test trials. A Sony stereo tape recorder (TC-260) manually controlled by E was employed to deliver the non-social reinforcement.

The experimental apparatus was housed in mobile laboratory #3, Department of Psychology, University of Western Ontario, which was moved to the various schools and institutions visited during this study. The mobile laboratory afforded a relatively consistent test environment for all Ss in this study.

The modifications to the Holden (1967) apparatus were four in number. First, the use of the stepper relay eliminated the need for the manual switching of preprogramed circuits. Second, the introduction of the pre-test sequences enabled E to pre-test S on a task more similar to the experimental task than was the case with Holden's (1967) pre-test task. Holden's pre-test task (1967; 1968; 1969) consisted of presenting S with straight and crooked arrangements

of four orange dots on black poster board. Third, provision was made for the presentation of crooked as well as straight line sequences. Fourth, the addition of a buzzer to signal the start of each sequence eliminated the need for verbal interaction during the sequence presentations whereas Holden (1968) reports that before each sequence his Ss were prepared with the verbal warning signal "ready".

## PROCEDURE

On the experimental task each S was tested individually in a session lasting approximately 18 minutes. The experimental testing was conducted in the mobile laboratory which housed the apparatus. The S was seated in a chair directly in front of and at a distance of six feet from the stimulus display screen which rested on a table. The display screen was located at or just below S's eye level. The experimenter was seated at a table directly opposit the left side of S at a distance of approximately three and one half feet. The apparatus control switches were located at E's table and were hidden from S's view by a 14 inch plywood blind which was mounted at the front edge and part way along the two sides of E's table. All Ss were given the same instructions by E.

In order to insure that S could discriminate between straight and crooked line sequences a pre-test phase was employed. The instructions for the pre-test phase can be found in Appendix A. Subsequent to the pre-test instructions S was shown eight pre-test sequences one

at a time. The S was allowed to make one error. If S made an error E would ask why the sequence was seen as straight or crooked. The E would then explain that the four dots of light made either a straight or a crooked line and the next sequence was presented. If S made a second error he was to be dropped from the study. No Ss were dropped from the study due to a poor pre-test performance. Following the pre-test phase the instructions for the test phase were read (see Appendix A). Following the sample buzzer sound the 50 test trials were begun.

The interstimulus intervals employed in this study were 0.5; 1.0; 2.0; 3.0; and 5.0 seconds after Holden (1967) and the inter-trial interval was 8 seconds. During the 50 test trials the lamps in each sequence remained illuminated for .05 seconds (Holden, 1967).

Three experimental conditions were employed in which the type of reinforcement given to S during his performance on the experimental task was varied. The 45 retardates (and the 45 yoked matched normals) were grouped, 15 Ss per group, then the groups were randomly assigned to one of the experimental conditions viz. no reinforcement, social reinforcement, or non-social reinforcement. In the No Reinforcement (NR) condition, E after reading the instructions to S did not interact further with S during the test trials. Care was taken to avoid non-verbal interaction such as smiling, nodding and/or eye contact. In the Social Reinforcement (SR) condition E continued to interact with S after the instructions were completed.

This interaction was restricted to non-verbal support such as smiling, nodding and eye contact (if S looked in E's direction), and verbal support in the form of the statements "good" and "that's fine" spoken alternately for the correct responses only. Both the verbal and non-verbal support were restricted to correct responses. Following incorrect responses E would say nothing and avoid eye contact, smiling and nodding by looking at his desk. In the Non-Social Reinforcement (NSR) condition Ss were informed of a correct response by the statements "correct" and "that's right" mechanically reproduced on recording tape. The recorder was operated manually by E for each correct response. The statements "correct" and "that's right" were presented alternately for each correct response. In this reinforcement condition E avoided all verbal and non-verbal interaction with S during the test trials.

For all Ss in all experimental conditions attempts at verbal exchange were handled by repeating the instruction "watch the screen". All Ss were permitted a delay of 5 seconds after termination of the fourth light in each sequence after which time E prompted S by saying "straight or crooked" in a monotone voice.

## CHAPTER III

## RESULTS

The criterion measure for the experimental task consisted of the number of correct responses made by the Ss for each interstimulus interval over the 50 test trials. A response was considered to be correct when S was able to correctly identify (verbally) either a straight or a crooked line. The misidentification of a line as straight or crooked consistuted an error.

The results will be presented in the following sections:

(a) An Analysis of the Correct Responses

(b) An Error Analysis for Presentations One Through Ten of Each Interstimulus Interval

(c) Socio-economic Status of Ss.

(d) Social Deprivation Scores

(e) Holden-Mosley Group Comparisons

(f) Experimental Task-Target Test Correlations

### ANALYSIS OF THE CORRECT RESPONSES

A 2 X 3 X 5 factorial analysis of variance, defined by 2 levels of Factor A (Group - normal; retarded), 3 levels of Factor B (Reinforcement Condition - no reinforcement; social reinforcement; non-social reinforcement), and 5 levels of Factor C (Interstimulus Interval - 0.5; 1.0; 2.0; 3.0; and 5.0 seconds), with repeated measures over Factor C, was carried out for the number of correct

responses. A summary of this analysis is presented in Table 2.

The results of this analysis yielded a significant main effect for the interstimulus interval (Factor C) indicating a significant decrease in the number of correct responses for all groups under all reinforcement conditions as a function of increasing the interstimulus interval. The Newman-Keuls procedure, employed to compare the differences between ordered pairs of totals for the five levels of Factor C (Interstimulus Interval), produced the following results: a significant ($p < .01$) difference between the 0.5 and the remaining four interstimulus intervals (the 0.5 second interstimulus interval having the largest number of correct responses); a significant ($p < .01$) difference between the 1.0 and the remaining three interstimulus intervals (the 1.0 second interval having the larger number of correct responses); and no significant differences between interstimulus intervals 2.0, 3.0 and 5.0 seconds where the number of correct responses varied inversely as a function of interstimulus interval magnitude. No other main effects or interaction effects in this analysis reached significance.

In order to investigate the effect of a procedural difference between the present study and that of Holden (1967), two additional 2 X 3 X 5 factorial analyses of variance were carried out employing: (i) the correct responses made to the straight line presentations ($N = 25$) alone; and (ii) the correct responses made to the crooked line presentations ($N = 25$) alone. In both analyses the interstimulus interval (Factor C) was the only significant effect indicated. The

TABLE 2

Summary of the Analysis of Variance for the Number of Correct Responses for Groups by Reinforcement Conditions Over Interstimulus Intervals

| Source of Variation | Sums of Squares | d.f. | Mean Squares | F | p |
|---|---|---|---|---|---|
| Between Subjects | 527.3978 | 89 | | | |
| A (Groups) | 4.5000 | 1 | 4.5000 | .7726 | |
| B (Reinforcement Conditions) | 25.1245 | 2 | 12.5623 | 2.1567 | |
| AB | 8.4933 | 2 | 4.2467 | .7290 | |
| Ss w. groups (error between) | 489.2800 | 84 | 5.8248 | | |
| Within Subjects | 643.6000 | 360 | | | |
| C (Interstimulus Interval) | 134.6756 | 4 | 33.6689 | 23.8162 | $p < .001$ |
| AC | 7.0222 | 4 | 1.7556 | 1.2418 | |
| BC | 5.6310 | 8 | .7039 | .4979 | |
| ABC | 21.2845 | 8 | 2.6606 | 1.8820 | |
| C x Ss w. groups (error within) | 474.9867 | 336 | 1.4137 | | |

results of these analyses are presented in Tables 3 and 4, Appendix D.

Individual Comparisons:

In order to assess the influence exerted by the social reinforcement, the non-social reinforcement, and the no reinforcement conditions on the perceptual task performance of the equal MA normal and retarded Ss, individual comparisons were carried out by means of the Newman-Keuls procedure employing a pooled error term. These comparisons failed to yield any significant between group differences for the three reinforcement conditions. The task performance of the retarded and equal MA normal groups under the social, non-social and no reinforcement conditions (totalled across the five interstimulus intervals) is presented in Figure 1.

## ERROR ANALYSIS

In the present experimental design each of the five interstimulus intervals is presented 10 times to every S in the same random order. In order to assess the effect of the repeated presentations of each interstimulus interval upon the perceptual task performance of the equal MA normals and retardates employed in this study, an analysis of the errors committed on each presentation of each interstimulus interval was carried out. The four factor analysis of variance was defined by 2 levels of Factor A (Group - normal; retarded); 3 levels of Factor B (Reinforcement Condition - no reinforcement; social reinforcement; non-social reinforcement); 10 levels

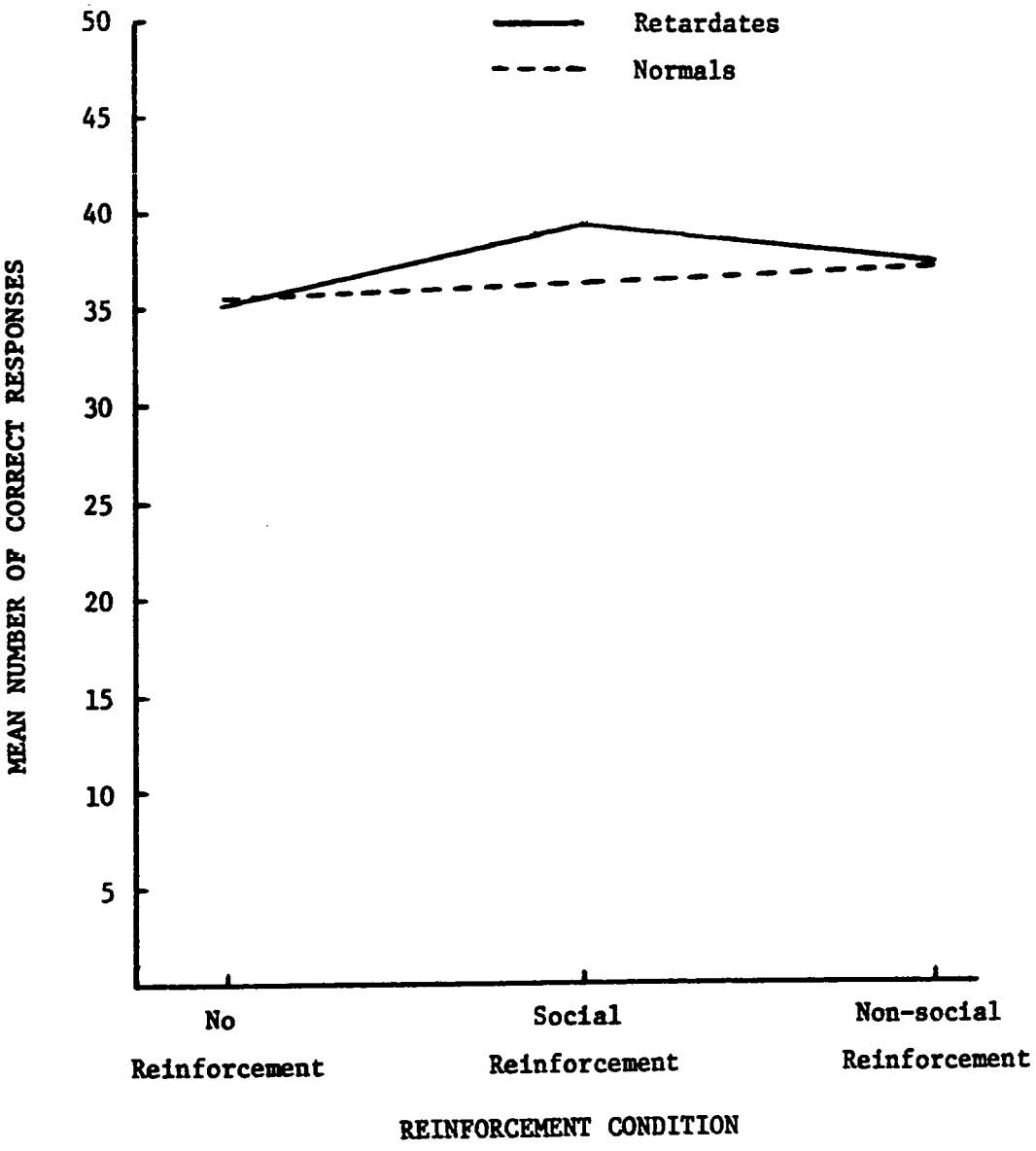


Figure 1. Mean number of correct responses for the normal and retarded subjects under the no reinforcement, social reinforcement, and non-social reinforcement conditions.

of Factor C (Presentation - one through ten) and five levels of Factor D (Interstimulus Interval - 0.5; 1.0; 2.0; 3.0; 5.0 seconds) with Factors C and D being within subject measures. A summary of this analysis is presented in Table 5.

This analysis revealed a significant main effect for Factor C (Presentation) which the Newman-Keuls analysis revealed was due to a significantly ($p < .01$) fewer number of errors for the second presentation of each interval relative to the remaining nine presentations which did not differ one from the other. The main effect for Factor D (Interstimulus Interval) was also significant. A subsequent analysis (Newman-Keuls) revealed significant ($p < .05$) performance differences between the 0.5 second interval and the remainder; between the 1.0 second interval and the other intervals; between interval 2.0 seconds and intervals 0.5, 1.0, and 5.0 seconds; and between the 3.0 and 5.0 second intervals (which did not differ) and the remainder. There was a sequential increase in the number of errors beginning with the 0.5 second interval and increasing through to the 5.0 second interval.

A significant Presentation X Interstimulus Interval (C X D) interaction effect and a significant Group X Reinforcement Condition X Interstimulus Interval ( A X B X D) interaction effect were obtained. A Newman-Keuls analysis of the Presentation X Interstimulus Interval interaction effect revealed that for each interstimulus interval there were significant differences ($p < .05$) in the number of errors for some

TABLE 5

Summary of the Analysis of Variance for Each Error on Each Presentation of Each Interstimulus Interval by the Groups Under the Three Reinforcement Conditions

| Source of Variation | Sums of Squares | d.f. | Mean Squares | F | p |
|---|---|---|---|---|---|
| Between Subjects | 52.58 | 89 | | | |
| A (Group) | .41 | 1 | .41 | $<1$ | |
| B (Reinforcement Condition) | 2.43 | 2 | 1.22 | 2.09 | |
| AB | .89 | 2 | .44 | $<1$ | |
| Ss w. groups (error between) | 48.85 | 84 | .58 | | |
| Within Subjects | 804.02 | 4410 | | | |
| C (Presentation) | 11.19 | 9 | 1.24 | 7.50 | $p<.001$ |
| AC | 1.68 | 9 | .19 | 1.13 | |
| BC | 2.70 | 18 | .15 | $<1$ | |
| ABC | 2.28 | 18 | .13 | $<1$ | |
| C X Ss w. groups | 125.37 | 756 | .17 | | |
| D (Interstimulus Interval) | 13.71 | 4 | 3.43 | 24.33 | $p<.001$ |
| AD | .71 | 4 | .18 | 1.27 | |
| BD | .52 | 8 | .06 | $<1$ | |
| ABD | 2.22 | 8 | .28 | 1.97 | $p<.05$ |
| D X Ss w. groups | 47.35 | 336 | .14 | | |
| CD | 85.08 | 36 | 2.36 | 14.69 | $p<.001$ |
| ACD | 4.29 | 36 | .12 | $<1$ | |
| BCD | 12.59 | 72 | .17 | 1.09 | |
| ABCD | 7.61 | 72 | .11 | $<1$ | |
| CD X Ss w. groups | 486.70 | 3024 | .16 | | |

presentations but these differences were not consistent across the five interstimulus intervals. This finding suggests that the repeated presentations of each interstimulus interval does not influence S's error performance in a systematic manner. The Newman-Keuls procedure which was also employed to make individual comparisons for the A X B X D interaction effect failed to reveal any significant between group differences for the five interstimulus intervals under the three reinforcement conditions. However, for the 3.0 second interstimulus interval the data were in the predicted direction ($p < .10$) where, under the social reinforcement condition, the retardates made fewer errors relative to the equal MA normal group.

## SOCIO-ECONOMIC STATUS OF SUBJECTS

The results obtained from the Two Factor Index of Social Position (Hollingshead, 1957) for the equal MA normals and the retardates in this study are presented in Table 6, Appendix D. The modal scores indicate that the equal MA normals are drawn from the middle-class as defined by Hollingshead (1957) and the retardates are drawn from the lower socio-economic class.

## SOCIAL DEPRIVATION SCORES

In order to determine the "degree" of the pre-institutional social deprivation experienced by the institutionalized retardates in the present study, a social deprivation scale (Zigler, Butterfield and Goff, 1966) was completed for the retardates subsequent to their respective experimental sessions. The scale provides a range of scores from a minimum of 55 to a maximum of 97+. The range of scores

for the no reinforcement retarded group was 67 to 100 with a median of 81; for the social reinforcement retarded group, 72 to 95 with a median of 83; and for the non-social reinforcement retarded group, 68 to 89 with a median score of 82. Group comparisons (t-tests) employing mean scores failed to produce any significant between group differences.

## HOLDEN-MOSLEY GROUP COMPARISON

A comparison of the chronological ages for the educable retardates and equal MA normal Ss in Holden's (1967) multiple line condition with the chronological ages for the retardates and the equal MA normal Ss in the no reinforcement condition of the present study revealed a significant difference between the equal MA normal groups ($t = 3.59$; 29 d.f., $p < .01$) with Holden's (1967) equal MA normals being older. A similar comparison for the retarded groups proved to be nonsignificant.

In order to investigate the influences exerted by chronological age on the task performance of the no reinforcement groups (equal MA normals; retardates) in the present study and the groups employed by Holden (1967) viz. equal MA normals and educable retardates, the percentage of correct responses was computed for these groups over each interstimulus interval (Table 7, Appendix D). The percentages for Holden's (1967) two multiple line condition groups are approximations derived from Figure 2 (p. 368) and calculated by means of the following formula:

$$\frac{\text{Mean number of correct responses X N}}{\text{Total number of correct responses}} \text{ X } 100$$

The percentages indicate that both the equal MA normals and the retardates in the present study responded more accurately than the groups employed by Holden (1967). A chi square analysis of the percentages revealed a significant ($p < .01$) difference between the Holden retardates and those of the present study with the latter group performing significantly better than the Holden group ( $X^2 = 17.26$, 4 d.f., $p < .01$). A similar test failed to reveal a significant difference between the two groups of normal Ss.

## EXPERIMENTAL TASK-TARGET TEST CORRELATIONS

Correlational analyses (Pearson Product Moment) for the experimental task total performance scores and the Target Test scores for each of the groups in this study yielded the correlation coefficients found in Table 8 (Appendix D). None of the correlation coefficients was significant, indicating that the ability measured by the Target Test is not linearly related to the ability tapped by the experimental task employed in this study. Scatter diagrams for each of the correlation coefficients reported in Table 8 (Appendix D) suggest that there are also no curvilinear relationships between the experimental task performance scores and the Target Test performance scores.

# CHAPTER IV

# DISCUSSION

The ensuing discussion will consist of the following major divisions: (i) the replication of Holden's (1967) findings; and (ii) the failure to support both the hypothesized retardate superiority under the social reinforcement condition and the hypothesized equal MA normal group superiority under the non-social reinforcement condition.

## REPLICATION OF HOLDEN'S RESULTS

The present study failed to replicate Holden's (1967) findings with reference to his educable retardate and equal MA normal multiple line condition groups. The failure to replicate his findings will be discussed under the following headings: (i) the no reinforcement condition; (ii) the chronological ages of Holden's groups and those of the present study; (iii) the Target Test matching procedure; (iv) the presentation of straight lines in comparison to the presentation of both straight and crooked lines; and (v) the retardate selection procedure.

### The No Reinforcement Condition:

Holden (1967), employing educable retardates, equal CA normals and equal MA normals, reported a significant difference in performance (i.e. the number of "straight" responses) for the 3.0 and 5.0 second

interstimulus intervals on a perceptual task with the equal MA normals and equal CA normals being superior to the educable retardates while not differing from one another. For the present discussion the task performance of Holden's (1967) equal MA normals and his educable retardates (for the multiple line condition) will be considered. It was expected that the task employed in the present study would be similar to the multiple line condition perceptual task employed by Holden (1967). It was also expected that the no reinforcement condition employed in the present study would be comparable to the reinforcement condition employed by Holden (1967) who, during the task performance, did not dispense reinforcers (tangible, intangible, or verbal). The results of the present study with respect to the no reinforcement groups (equal MA normals; retardates) failed to support Holden's (1967) findings in that for the 3.0 and 5.0 second interstimulus intervals no significant between group differences were demonstrated.

An examination of Holden's (1967) reinforcement procedure revealed that the equal MA normals and educable retardates were shown an assortment of novelties prior to testing and were allowed to chose one upon completion of their respective test sessions. During his experimental sessions proper no reinforcement (tangible, intangible or verbal) was dispensed. The influence of this procedure cannot be assessed directly on the basis of Holden's (1967) design since he did not include an appropriate control condition i.e. a group of equal

MA normals and a group of educable retardates not shown the assortment of novelties prior to testing, however certain inferences can be made based upon Holden's (1967) findings.

First, in Holden's study the equal CA normal group was not shown the assorted novelties prior to testing while the equal MA normal group was. There were no significant differences in the performance of these two groups. It might be argued that the lack of reinforcement for the equal CA normals tended to reduce their performance whereas the thought of receiving a reward may have increased the performance of the equal MA normals. However, in a later study, Holden (1969) demonstrated that when neither the equal CA nor equal MA normal groups received a reward subsequent to their respective test sessions their performance was similar. This tends to suggest that the influence exerted by the thought of receiving a reward by the equal MA normals in Holden's (1967) study was negligible.

A second indication that the influence exerted by showing the assorted novelties to the equal MA normals and the retardates was not strong is demonstrated by the inferior performance of the retardates relative to the equal MA normals. The findings of Zigler and DeLabry (1962), Zigler and Unell (1962) and Terrell, Durkin and Wiesley (1959) suggest that the task performance of familial retardates and lower-class normal children is better for tangible reinforcers than for the intangible reinforcers whereas the reverse is true for middle-class children. Although Holden (1967) failed to state the socio-economic status of his equal MA normal Ss it seems apparent that whatever

reinforcement contingencies are operating (if any) these are more advantageous for the equal MA normal Ss than for the educable retardates. If the thought of receiving a tangible reinforcer was strong then it would be expected that the retardates would be more favorably influenced relative to a middle-class group of equal MA normals or "equally" influenced relative to a lower-class group of normals matched for MA. Holden's (1967) results indicate that the retardates are not more favorably influenced. Therefore it appears that the thought of receiving a tangible reward is not a sufficiently strong reinforcer. It would seem then that Holden's (1967) experimental situation may be viewed as a no reinforcement condition and comparable to the no reinforcement condition employed in the present study. In terms of the reinforcement contingencies and the task employed one would expect a replication of the findings reported by Holden (1967) with reference to his equal MA normals and educable retardates for the multiple line condition. However, the expected replication failed to occur.

Chronological Age Difference:

In comparing the chronological ages (CA's) of Holden's (1967) equal MA normals ($\overline{X}$ = 9.85) and educable retardates ($\overline{X}$ = 16.15) with the CA's of the equal MA normals ($\overline{X}$ = 8.40) and retardates ($\overline{X}$ = 15.12) employed in the present study it was noted that the retarded group comparison did not yield a significant CA difference. In contrast, a comparison between the two equal MA normal groups revealed a significant ($t = 3.59$; 29 d.f., $p < .01$) CA difference with Holden's (1967) equal

MA normal group being significantly older. An examination of the percentages of correct responses for the equal MA normal groups (Table 7, Appendix D) reveals that the equal MA normal Ss in the present study demonstrate a consistently higher percentage of correct responses for each of the task's five interstimulus intervals. Since the equal MA normals in the present study are significantly younger than Holden's (1967) equal MA normal Ss and since their performance on the task is superior to Holden's (1967) equal MA normals it would appear that the chronological age difference does not account for the failure to replicate Holden's (1967) findings.

Target Test Matching Procedure:

In the present study an additional matching procedure (Target Test; Reitan, 1964) was employed to control for possible pre-experimental task ability differences which were not controlled for in the series of studies conducted by Holden (1965; 1966; 1967; 1968; 1969). The correlations (Pearson's r) between the Target Test performance scores and the experimental task performance scores revealed that the degree of association was not significant (Table 8; Appendix D). The Target Test matching criterion imposed by this study does not appear to account for the failure to replicate Holden's (1967) findings for the no reinforcement equal MA normals and the no reinforcement retarded group in the present study.

The introduction of the Target Test matching procedure in combination with the MA matching procedure resulted in 45 matched retardate-equal MA normal pairs. The matching criteria employed had

the effect of reducing the number of retarded Ss from an N=74 to an N=45. The reduction in sample size produced by the imposition of the matching criteria may have introduced a selection bias, i.e., the selection of retardates with higher MA's and Target Test scores relative to the distribution of MA's and Target Test scores found in the retarded subject pool (N = 74). In order to examine this possibility a chi square analysis was carried out employing frequency scores for the experimental sample (N = 45) and the remainder of the retarded Ss (N = 29) over the following combined MA intervals: four to six years; seven to nine years, and ten to thirteen years. The chi square obtained from the 2 X 3 contingency table ($X^2$= 18.19) proved to be significant ($p < .001$). These data (Figure 2, Appendix E) suggest that the retardates selected from the retardate sample pool (N = 74) for inclusion in the experimental group (N = 45) tended to be comprised of retardates having higher mental ages relative to those retardates for whom a match was not found (N = 29). A second chi square analysis was carried out for the Target Test frequency data employing two Target Test score groupings (i.e., scores from one to ten and scores from eleven to twenty inclusive). The 2 X 2 contingency table produced a significant ($p < .001$) chi square ($X^2$ = 22.04) which indicates that there was a significantly greater number of retardates with high Target Test scores in the experimental group relative to those retardates for whom a match was not found.

The above analyses suggest that the matching criteria imposed upon the Ss of the present study introduced a selection bias which

resulted in the experimental group of retardates having a significantly larger number of high MA's and a significantly larger number of high Target Test scores relative to the total retardate subject pool (N = 74). The matching criteria resulted in the above chance elimination of those retardates with low MA's and low Target Test scores (N = 29).

Since Holden (1967) did not report the mental ages of his retarded Ss comparisons employing the IQ's were made between his multiple line condition retarded Ss and (i) the IQ's of the no reinforcement condition retarded Ss in the present study, (ii) the IQ's of the total retarded experimental sample (N = 45) and (iii) the IQ's of the total retarded subject pool (N = 74). The comparison between Holden's (1967) retardates and the no reinforcement condition retarded Ss in the present study yielded a significant difference ($t = 3.26$; 29 d.f.; $p < .01$) with the retardates in the present study having significantly higher IQ scores. The comparison between Holden's (1967) retardates and the total experimental sample of retardates employed in the present study (N = 45) demonstrated a significant difference ($t = 3.14$; 59 d.f.; $p < .01$) with the retardates in the present study again having significantly higher IQ scores. The third comparison produced a significant difference ($t = 2.31$; 88 d.f., $p < .05$) with the retardates in the total retardate subject pool (N = 74) having significantly higher IQ scores than those of Holden's (1967) multiple line condition retardate group.

These comparisons suggest that although a sampling bias was

operative with reference to the retardate experimental sample, the retardate subject pool IQ scores were significantly higher ($p < .05$) than those of Holden's (1967) multiple line condition retardate group suggesting that the selection criteria employed for the retarded Ss in the present study produced retardates with generally higher IQ's and possibly higher MA's.

Caution must be exercised in interpreting the above comparison data since Holden (1967) employed the WISC or the WAIS to obtain his IQ scores and the IQ scores of the retardates in the present study were obtained from the PPVT.

Line Presentation Difference:

It was noted that Holden (1967; 1968; 1969) employed a task which presented only straight line sequences with the rationale that stimulus displacement (the displacement of the lights around the actual progression line in an erratic manner) reflects the dissipation of a locus-defining trace to below the level necessary for adequate continuity. In the present study an equal number of both straight and crooked line patterns were randomly presented to the Ss in order to reduce the possibility of establishing a perseverative type of responding or a response bias.

This procedural difference eliminated the influence of Holden's (1967) pretest instructions which were designed to mislead his Ss since there was a suggestion that the line may have been crooked when, in fact only straight lines were presented. The presentation of crooked as well as straight lines may be responsible for the percentage dif-

ferences presented in Table 7 (Appendix D).

As noted in the results chapter a chi square analysis of these percentages revealed a significant between study difference ($p < .01$) for the retarded Ss but not for the normal Ss with the retardates in the present study being significantly superior to Holden's retardates. These data suggest that the presentation of straight plus crooked lines may constitute an easier task than that employed by Holden (1967). In order to investigate this possibility a comparison between Holden's (1967) retarded group and the no reinforcement condition retarded Ss in the present study was made using the straight line data percentages (Table 10, Appendix D). If the presentation of both straight and crooked line constitutes an easier task than the presentation of straight lines alone (for the retarded groups), as the chi square analysis suggests ($X^2 = 17.258$; 4 d.f.; $p < .01$), then an analysis of the straight line data percentages for the two retarded groups should yield comparable group performance scores since, in the present study, the straight and crooked lines were presented randomly. The chi square analysis employing the straight line data percentages found in Table 10 (Appendix D) for the retarded groups produced a significant between group difference ($X^2 = 9.682$; 4 d.f.; $p < .05$) with the retardates in the present study demonstrating superior performance percentages. A chi square analysis for the two groups of normal Ss employing the straight line data percentages failed to demonstrate significant between group differences ($X^2 = 1.459$; 4.d.f.; $p > .05$). The above findings suggest that the presentation of both straight and crooked

lines does not constitute an easier task. The higher percentages of correct responses for the no reinforcement condition retardates in the present study may be related to their significantly higher IQ scores ($t = 3.26$; 29 d.f.; $p < .01$) relative to Holden's (1967) retarded group since these tend to reflect higher MA's.

An examination of the percentages of correct responses both for the combined straight and crooked line presentations and for the straight line presentations alone revealed that the poor performance of Holden's (1967) retardates on the 3.0 and 5.0 second interstimulus intervals accounted for the significant chi square values. This poor performance also accounts for Holden's (1967) significant Group X Interval interaction effect. In order to afford a degree of comparability between Holden's (1967) and the present task the straight and crooked line data were analyzed separately and the straight line data (Table 3, Appendix D) compared to Holden's findings. This comparison failed to support Holden's interaction effect for the 3.0 and 5.0 second interstimulus intervals but it did support the interstimulus interval main effect. This analysis was also consistent with the combined data analysis presented in Table 2. A replication of Holden's (1967) study by Belmont and Butterfield (1969) also failed to support Holden's (1967) Group X Interval interaction effect for the 3.0 and 5.0 second interstimulus intervals. It can be concluded that the straight line data analysis of the present study plus the Belmont and Butterfield (1969) failure to replicate the Holden (1967) finding

suggests that Holden's (1967) data, relating to the Group X Interval interaction, may not be a reliable finding.

Retardate Selection Procedure:

A personal communication from Edward Holden revealed that in the selection of his educable retardates he excluded epileptics, those retardates taking medication, and those retardates exhibiting apparent signs of organicity. The selection of retardates for the present study included not only the current status data, i.e. that employed by Holden (1967), but also case history data (as noted in Chapter II). The selection procedure employed in the present study may have been more effective in ruling out less obvious cases of organic involvement relating to the mental retardation exhibited by members of the retardate sample. There is evidence (Spivack; 1963) to suggest that brain injured retardates perform significantly more poorly on perceptual type tasks e.g. critical flicker frequency; phi movement threshold; figure-background and constancy tasks, relative to non-brain injured subjects. Robinson and Robinson (1965) also cite studies which suggest that brain injured children matched for CA and MA with cultural familial retardates on perceptual motor type tasks e.g. the Bender-Gestalt. Since Holden's (1967) retardate selection procedure did not employ case history data the probability of including in his sample retardates whose task performance may be related to less obvious organic factors was greater than that afforded by the procedure employed to select retardates in the present study and this factor may have contributed to the failure of the present study to replicate

Holden's (1967) findings.

Holden, in his personal communication, states that the reported significant difference between his equal MA normals, his equal CA normals, and his educable retardates on the 3.0 and 5.0 second interestimulus intervals may have been a spurious finding since a replication of the study by John Belmont (Belmont and Butterfield, 1969) employing educable retardates and an equal CA normal group failed to find significant between group differences.

In summary, after considering the above mentioned aspects of the two studies two conclusions may be drawn. First, based on the personal communication from Holden the reported significant between group differences may be considered spurious and hence the results of the present study have, in effect, replicated Holden's (1967) finding in that no significant between group differences were found. However, even though Holden cites the findings of Belmont and Butterfield (1969) to support the statement that his significant between group differences might be spurious, he does not explain on the merits of his study, why he feels his findings are spurious and, as such, his findings need further examination. Second, if the different selection procedures allowed differing biological etiological factors to operate in the two retardate samples then these may have been responsible for the differential task performance between Holden's (1967) educable retardates and the retardates employed in the present study.

## FAILURE TO SUPPORT THE EXPERIMENTAL HYPOTHESES

The results obtained through the experimental manipulation of the reinforcement condition factor failed to support the following hypotheses: (i) that the perceptual task performance of the retardates would be significantly superior under the social reinforcement condition relative to that of the equal MA normals; and (ii) that the perceptual task performance of the equal MA normals would be significantly superior under the non-social reinforcement condition relative to that of the retarded group.

The failure to support these experimental hypotheses will be discussed under the following headings: (i) social deprivation; (ii) the appropriateness of the perceptual task employed; and (iii) the chronological age range of the equal MA normal non-social reinforcement Ss.

Social Deprivation:

The research of Zigler and his associates has demonstrated the efficacy of social reinforcers when familial retardates are compared with equal MA normals on satiation type tasks. The purpose of the present study was to investigate the research findings of Zigler and his associates employing a perceptual type task. A major portion of Zigler's research employed two reinforcement conditions i.e. a support condition and a non-support condition. The present study employed three reinforcement conditions viz. social reinforcement, non-social reinforcement, and no reinforcement. Zigler's research findings would predict a differential performance between equal MA normals and familial retardates as a function of the type of reinforcement with the familial retardates

being more responsive to supportive social reinforcement relative to the equal MA normals. This differential responsiveness Zigler would attribute to non-intellective factors such as the degree of social deprivation experienced prior to institutionalization.

The failure to demonstrate the effectiveness of social reinforcement (support) on the perceptual task performance of the retardates employed in this study prompts an examination of the degree of social deprivation present in the retarded groups.

Zigler (1963b) states that social deprivation is a phenomenon which becomes built into the motivational structure of the individual and serves as a mediator for that individual's interactions with the environment. It is also Zigler's contention that social deprivation results in the enhanced effectiveness of social reinforcers. For 37 of the retardates in the present study the Social Deprivation Scale (Zigler, Butterfield and Goff; 1966) was completed subsequent to their experimental sessions. The objective measure of pre-institutional social deprivation provided by the Social Deprivation Scale indicated that the retarded groups have experienced a similar degree of socially depriving events and experiences prior to their present period of institutionalization. In this study the three groups of retardates were rated as deprived but the introduction of the social reinforcement condition did not significantly effect performance relative to the other two reinforcement conditions (viz. non-social reinforcement and no reinforcement) although the data were in the predicted direction ($p < .10$; Table 9, Appendix D) with the social reinforcement condition

retardates demonstrating superior performance relative to the remaining two groups of retardates.

Zigler (1963b) also suggests that the amount of social deprivation experienced prior to being institutionalized determines the influence that institutional living will have on the effectiveness of social reinforcers. Zigler and Williams (1963) state that for children who have experienced greater amounts of social deprivation prior to being institutionalized, institutional living adds relatively little to an already high motivation for social reinforcers, whereas for those retardates who have had relatively good homes institutional living produces a greater increase in the effectiveness of social reinforcers as a function of the time spent in the institution. The error of conceptualizing institutional living as a homogeneous psychological variable was investigated by Zigler and Butterfield (1965a). These authors demonstrated that children from two institutions defined as having differing social climates behave differently with respect to the amount of time spent on an open-ended satiation type task.

The present study employed residents from three institutions. Since no data were obtained as to the "type" of social climates afforded by these institutions an evaluation of the effect of the institutionalization upon social reinforcers cannot be made.

This discussion suggests two possibilities: (i) that the effect of social deprivation does not produce in the institutionalized retardate a heightened responsiveness to social reinforcers; or (ii) that the perceptual task employed does not permit a demonstration

of the efficacy of social reinforcers.

In view of the previous experimental support which suggests that social deprivation does increase the institutionalized retardate's responsiveness to social reinforcers the second of the aforementioned possibilities will be examined.

Appropriateness of Experimental Task:

It will be recalled that a majority of the studies conducted by Zigler and his associates employed a simple motor task (the Marble Dropping Task) to demonstrate the efficacy of a support condition relative to a non-support condition. Zigler employed as the dependant measure for this task the amount of time the S spent on the task (either total time and/or the time spent on each part of the task). As noted earlier, Stevenson (1965) cited the Marble Dropping task as a task which fulfills the five criteria that he considers necessary if an experimental task is to be effective in assessing the influence of social reinforcers.

In order to determine the appropriateness of the perceptual task employed in the present study in demonstrating the efficacy of social reinforcers the criteria proposed by Stevenson (1965) will be reviewed.

First, Stevenson (1965) states that the task must not possess high intrinsic interest since this will reduce the effect of an adult's supportive comments. For the rectilinear dot progression task employed in the present study there are no objective data upon which to determine the amount of intrinsic interest generated by the task. However,

relative to a simple motor task (Marble Dropping task) the rectilinear dot progression task may be said to possess a higher degree of intrinsic interest at least in the initial phase of the experimental test session.

The second criterion states that the task should not have a visible end product or a clear terminus since those tend to be intrinsically motivating and can obscure the effect of social reinforcers. The present perceptual task meets this criterion in that the S's response does not yield a visible cue to task completion. Line after line are presented and S is not aware that the task has a set terminating trial.

The third criterion states that the task should minimize the effects of early learning in order to reduce individual differences based on previous learning. The previous learning required by the rectilinear dot progression task involves the ability to count to four in an orderly sequence and to recognize a straight as opposed to a crooked line where straight refers to the orderly linear progression of the dots of light and not to the spatial orientation of the line relative to a vertical or horizontal referent. In order to determine S's ability to count to four he is requested to do so as part of the test phase instructions (Appendix A). The pre-test phase of the present study was designed to assess S's ability to recognize a straight and a crooked line. The Ss not able to make the discrimination were not included in the study. It is interesting to note that no Ss were

eliminated due to their inability to count and/or discriminate between straight and crooked lines. As a consequence it was felt that the prior learning necessary for adequate task performance was relatively similar for all Ss.

The fourth criterion asserts that the task should permit the arbitrary dispensation of supportive comments. The research conducted by Zigler and his associates employing the marble dropping task reveals that, in the supportive condition, approximately four praise statements were randomly presented after a pre-arranged number of responses throughout S's task performance. Since the major dependent variable was the time S would spend on the task, the supportive comments appear to be related to a general responding rather than to a specific response i.e. correct color in the correct hole. Hence, rather than reinforcing a specific response Zigler's supportive condition appears to be designed to encourage persistence of responding in general. Therefore one can view the dispensation of Zigler's supportive comments as more arbitrary (not related to specific responses) than is the case in the present study which employs as its dependent measure the number of correct responses. Zigler himself pointed out that his Ss were not informed of their errors and received the reinforcement for incorrect as well as correct responses (Zigler, Hodgden and Stevenson, 1958; Zigler, 1961).

It is essential to note that where the number of errors was employed as a dependent measure the data did not support the hypotheses that (i) retardates would make a lower proportion of errors relative to a

group of equal MA normals (Zigler, Hodgden and Stevenson, 1958) and, (ii) that a "high deprived" group of retardates would make a lower proportion of errors relative to a "low deprived" group of retardates (Zigler, 1961) due to a higher motivation to secure adult contact through compliance to instructions. This lends support to the statement that Zigler's supportive condition appears to be designed to encourage a general persistence of responding. An exception to the above findings is noted in the data reported by Shepps and Zigler (1962). These authors, employing an error score, were able to demonstrate a significant difference (as a function of the reinforcement condition) in the performance of familial and organic retardates matched for MA. The Ss in a non-support condition demonstrated a significantly greater number of errors relative to Ss in a support condition. It was noted, however, that if S made ten consecutive errors he was reinstructed as to the correct hole. This procedure therefore, may have resulted in some verbal interaction for the non-support condition Ss since these Ss made significantly more errors relative to the support condition Ss. This increased verbal interaction may have perpetuated the error type responding since there is no reason to assume that the non-support retardates were less motivated to seek social interaction with E relative to the support condition retardates. Since no data is presented as to the number of reinstructions given, the error data of this study are highly suspect in view of the error data reported by Zigler, Hodgden and Stevenson (1958) and Zigler (1961).

The social reinforcement condition in the present study consisted of alternately presenting one of two supportive statements after each correct response. The supportive comments were response specific and cannot be considered to be dispensed arbitrarily. Therefore the rectilinear dot progression task as employed in the present study did not permit the arbitrary dispensation of supportive comments.

The fifth and final criterion suggested by Stevenson (1965) holds that the task should employ discrete responses. The perceptual task employed in the present study meets this criterion since the dependent measure consists of the number of correct responses.

In summary, the rectilinear dot progression task does not fully meet the criteria proposed by Stevenson (1965). It does fulfill the criteria which relate to having a visible end product, the utilization of discrete responses, and the minimization of the effect of earlier learning. But it clearly does not meet the criterion of permitting the arbitrary dispensation of supportive comments and there is some doubt as to the degree of intrinsic interest inherent in the task. On the basis of these criteria the rectilinear dot progression task does not appear to be particularly suitable in terms of assessing the efficacy of supportive statements dispensed by adults.

Chronological Age Range of Equal MA Normals:

The failure of the present data to support the hypothesized equal MA normal performance superiority under the non-social reinforcement condition relative to that of the retarded group will be discussed in terms of the chronological age range of the equal MA normal Ss in

this study.

Zigler and Kanzer (1962) demonstrated that within the limits of verbal reinforcers "correct" reinforcers are more effective for middle-class children relative to lower-class children (Terrell, Durkin and Wiesley, 1959), while "praise" reinforcers were more effective for lower-class than for middle-class children. Since "praise" reinforcers (social reinforcement condition) and "correct" reinforcers (non-social reinforcement condition) were employed in the present study a subsequent evaluation of the socio-economic status of the families of the Ss in our sample was seen as necessary. In order to determine the social class of the families of the normal Ss in the present study the Two Factor Index of Social Position (Hollingshead, 1957) was employed. The information required to complete this scale was obtained from the parents directly since such confidential material (contained in the school records) was not accessible to E. The index was completed for 10 Ss in the no reinforcement condition; 13 Ss in the social reinforcement condition; and 12 Ss in the non-social reinforcement condition. The index scores (Table 6; Appendix D) indicate that the modal social class for the three normal groups was Class III (middle-class).

The Two Factor Index of Social Position was also completed for the retarded Ss in this study. The necessary information was obtained from their case books. Since some information was missing the scale was completed for 14 Ss in the no reinforcement condition; 13 in the social reinforcement condition; and 12 Ss in the non-social reinforcement

condition. The modal category for all retarded Ss was Class V (Table 6; Appendix D) indicating that the retarded Ss were drawn from lower-class families. In view of Zigler and Kanzer's (1962) findings the retardates in the present study who were drawn from lower-class families should respond more effectively to "praise" reinforcers (social reinforcement) whereas the equal MA normal children who were drawn from middle-class families should respond more effectively to "correct" reinforcers (non-social reinforcement). However, the data (Table 2) revealed no significant Group X Reinforcement Condition interaction effect in spite of the class difference. As noted in Figure 1 the performance of the non-social reinforcement equal MA normal group appears to be a major factor in the failure to obtain the hypothesized interaction effect. The wide chronological age range of this particular group may explain the lack of responsiveness under the non-social reinforcement condition.

The effectiveness of attention and support (praise) as reinforcers diminishes with maturity and is replaced by the reinforcement inherent in the information that one is correct. Zigler and Kanzer (1962) employed middle and lower-class children whose chronological ages ranged from a low of 7.2 years to a high of 8.7 years. The chronological ages of their middle-class correct group, in particular, ranged from 7.3 to 8.3 years. In discussing their results Zigler and Kanzer (1962) state:

"the lower class seven-year-old child is developmentally

> lower than the seven-year-old middle-class child in that he has not made a transition in which reinforcers signifying correct replace praise reinforcers in the reinforcer hierarchy. (p. 161)"

For Zigler and Kanzer (1962) the transition period has apparently occurred by about 7.3 years of age. The middle-class normal Ss in the non-social reinforcement condition of the present study had chronological ages ranging from 5.6 years to 12.3 years with a median age of 7.8 years. This wide chronological age range when compared to the restrictive chronological age range of the Zigler and Kanzer study allows for the possibility that many of the Ss in this particular group had not yet reached the transition period and were relatively more responsive to "praise" than to "correct" reinforcers.

In conclusion, the broad chronological age range of the non-social reinforcement equal MA normal group as well as the relative unsuitability of the perceptual task for assessing the efficacy of social reinforcers (with reference to the performance of the retardates) can account for the failure to obtain the hypothesized differential performance as a function of the reinforcement condition employed.

## EXPERIMENTAL TASK

It has been suggested by Baumeister (1967) and Belmont and Butterfield (1969) that the operation of "floor" and/or "ceiling" effects can complicate the interpretation of the experimental data. In the present study the perceptual task employed was relatively free

of "floor" and "ceiling" effects in that it afforded the Ss a high degree of response latitude as evidenced by the significant interstimulus interval effect (Table 2) which was consistent for all subsequent analyses employing this factor. Holden (1967) obtained a similar finding for the same task as did Belmont and Butterfield (1969). For interstimulus intervals 0.5, 1.0, 2.0, 3.0 and 5.0 seconds the performance (number of correct responses) decreased sequentially with the 0.5 seconds producing a significantly greater number of correct responses relative to the four remaining intervals. The 1.0 second interstimulus interval produced a significantly greater number of correct responses than the remaining three interstimulus intervals which did not differ significantly one from the other.

The response latitude afforded by the experimental task is reflected by the percentage of correct responses made by the combined experimental groups over each interstimulus interval as follows: 0.5 seconds - 82.9%; 1.0 seconds - 78.2%; 2.0 seconds - 72.7%; 3.0 seconds - 70.8%; 5.0 seconds - 67.6%.

# CHAPTER V

## SUMMARY

The preceeding study was prompted by the research of Edward Zigler and his associates who take as their central thesis the assertion that performance on experimental as well as real-life tasks is never the product of the familial retardate's cognitive structure alone, but rather a combination of intellective and non-intellective factors. These investigators principally employed satiation and concept switching type tasks to demonstrate that non-intellective factors such as social deprivation, negative reaction tendencies, institutionalization, success expectancies, outer directed modes of problem solving, and differing reinforcer hierarchies exert an influence on the task performance of institutionalized familial retardates.

This study was designed to assess by means of a perceptual task (i) Zigler's hypothesis that institutionalized retardates exhibit a heightened motivation to seek and maintain social interaction with supportive adults and (ii) that non-institutionalized equal MA normals and institutionalized retardates respond differentially as a function of the type of reinforcement.

The perceptual task employed was a modification of the task originally employed by Holden (1967; 1968; 1969) to investigate the stimulus trace deficit position espoused by Ellis (1963). It required Ss to judge the rectilinearity of straight and crooked line

patterns generated by the sequential illumination of neon lamps.

The significant main effect for the interstimulus interval factor remained consistant throughout this study indicating a significant decrease in the number of correct responses for all groups under each reinforcement condition in inverse relationship to the interstimulus interval magnitude.

Individual comparisons between the equal MA normals and the retardates under the social reinforcement condition failed to support Zigler's hypothesis that institutionalized retardates exhibit a heightened motivation to seek and maintain social interaction with supportive adults. A comparison of the rectilinear dot progression task with the criteria proposed by Stevenson (1965) for tasks sensitive to the effects of social reinforcers revealed that this task was not particularly suited to demonstrating the efficacy of social reinforcers. The perceptual task employed was cited as a major factor in the failure of the social reinforcement condition to influence the performance of the retardates.

Individual comparisons between the equal MA normals and the retardates under the non-social reinforcement condition failed to support the hypothesized equal MA normal task performance superiority relative to that of the retarded group. The wide chronological age range of the non-social reinforcement equal MA normal group was advanced as a probable explanation for the failure to obtain the hypothesized differential performance as a function of the reinforcement condition.

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# APPENDIX A

## INSTRUCTIONS

PRE-TEST PHASE INSTRUCTIONS

- I am going to show you four dots of light.
- These dots of light will appear on the black screen on the table in front of you.
- These dots of light will make a straight line or a crooked line.
- I want you to tell me whether the dots of light make a straight line or a crooked line.
- If the line is straight say "straight".
- If the line is crooked say "crooked".
- Are there any questions?
- Watch the screen.

TEST PHASE INSTRUCTIONS

- Count to four.
- How many fingers do you see? (E holds the four fingers of his left hand just above the blind.)
- Now this time you will see four dots of light which will go on and off, one after the other.
- These dots of light will appear on the black screen on the table in front of you.
- The dots of light, when put together, will make a straight line or a crooked line.
- After the last dot of light I want you to tell me whether the four dots of light come on in a straight line or a crooked line.
- If they come on in a straight line say "straight" after the last dot.
- If they come on in a crooked line say "crooked" after the last dot.
- Before each sequence of lights you will hear a buzzer which will tell you to watch the screen for the dots of light.
- Are there any questions?
- This is the buzzer sound you will hear before each trial (E sounds buzzer).
- Watch the screen.

# APPENDIX B

## Technical Description of the Experimental Apparatus

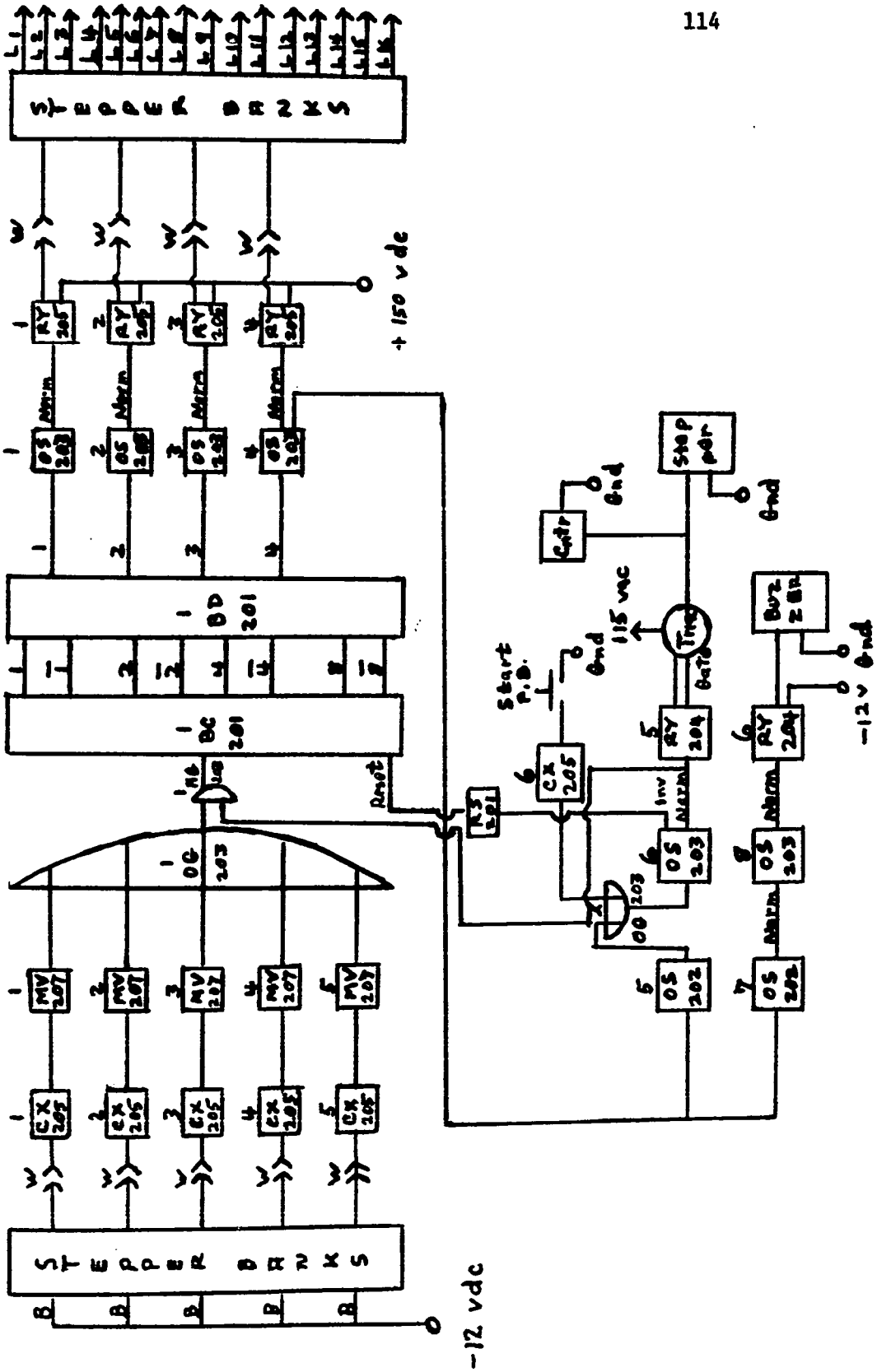
## Description of the Rectilinear Dot Progression Experimental Apparatus

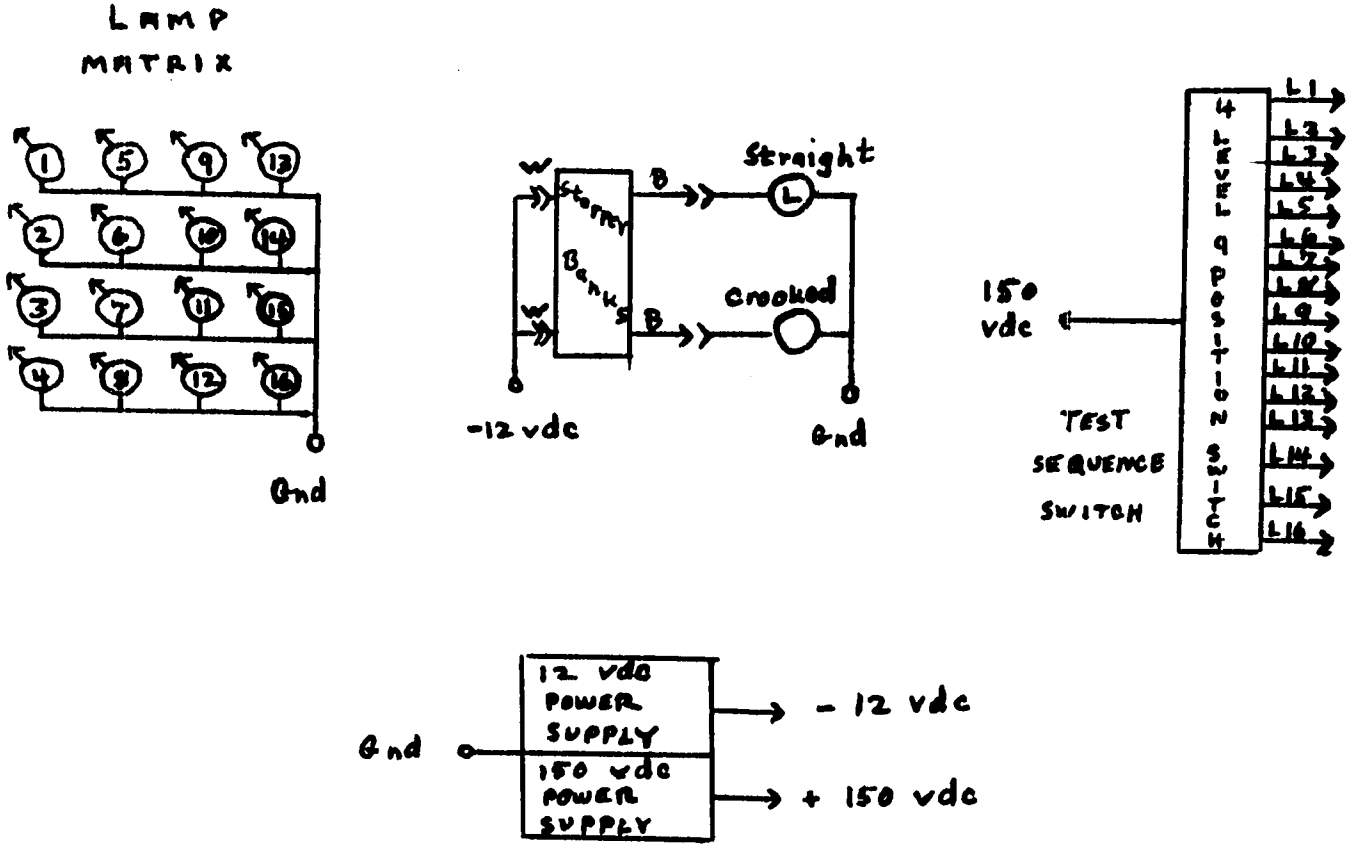
The following schematic and description of the experimental apparatus has been prepared by Mr. Thomas McGuire, Technical Advisor, Department of Psychology, University of Western Ontario.

1. Wiring on the back pins of the stepper relay determines which lamps are associated with any particular step of the program.
2. The count in the BD 201 determines which lamp will be on.
3. The "on" time of the matrix lamps is determined by the "on" time of O.S.'s 1-4.
4. The inter-lamp interval (within a program step) is determined by which MV 207(1-5) is turned on.
5. Wiring on the back pins determines which MV 207 is turned on for a particular step of the program.
6. AG 203 #1 ensures that the lamp matrix will be "off" during the inter-step interval.
7. Inter-step interval is the sum of the intervals generated by O.S.'s 5 and 6.
8. Wiring on the back pins determines which of the straight or crooked lamps comes on for a particular step.
9. Interval between the last lamp of a step and the buzzer signalling the beginning of the next step is the sum of the

intervals of O.S.'s 7 and 8.

10. Operator is required to step the program to step 1 manually. Operation will be automatic for the remainder of the program.


+150 vdc
-12 vdc
115 vac
Start P.B.
Stop pdr
End
Alarm
Inv
Buz 201
-12 v End


LAMP
MATRIX
1
5
9
13
2
6
10
14
3
7
11
15
4
8
12
16
Gnd
W
W
Stepper
Banks
B
B
Straight
L
Crooked
-12 vdc
Gnd
150
vdc
TEST
SEQUENCE
SWITCH
4 LEVEL 9 POSITION SWITCH
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
L13
L14
L15
L16
Gnd
12 vdc
POWER
SUPPLY
150 vdc
POWER
SUPPLY
- 12 vdc
+ 150 vdc

## APPENDIX C

## The Number of Correct Responses for the Six Experimental Groups for Each Interstimulus Interval

RETARDED - NO REINFORCEMENT GROUP

| Subject Number | Interstimulus Interval 0.5 | 1.0 | 2.0 | 3.0 | 5.0 | Total |
|---|---|---|---|---|---|---|
| 1 | 9 | 9 | 6 | 8 | 9 | 41 |
| 2 | 7 | 8 | 6 | 7 | 6 | 34 |
| 3 | 9 | 9 | 8 | 9 | 9 | 44 |
| 4 | 6 | 6 | 5 | 4 | 4 | 25 |
| 5 | 3 | 7 | 8 | 6 | 5 | 29 |
| 6 | 6 | 7 | 9 | 8 | 7 | 37 |
| 7 | 9 | 9 | 6 | 7 | 6 | 37 |
| 8 | 7 | 9 | 6 | 5 | 8 | 35 |
| 9 | 8 | 7 | 7 | 7 | 7 | 36 |
| 10 | 10 | 9 | 7 | 6 | 7 | 39 |
| 11 | 9 | 8 | 6 | 9 | 8 | 40 |
| 12 | 3 | 7 | 7 | 4 | 4 | 25 |
| 13 | 9 | 7 | 7 | 7 | 6 | 36 |
| 14 | 7 | 8 | 9 | 6 | 7 | 37 |
| 15 | 8 | 8 | 8 | 8 | 6 | 38 |
| Total | 110 | 118 | 105 | 101 | 99 | 533 |

RETARDED - SOCIAL REINFORCEMENT GROUP

| Subject Number | Interstimulus Interval 0.5 | 1.0 | 2.0 | 3.0 | 5.0 | Total |
|---|---|---|---|---|---|---|
| 1 | 10 | 9 | 9 | 9 | 9 | 46 |
| 2 | 10 | 9 | 6 | 7 | 7 | 39 |
| 3 | 10 | 8 | 8 | 8 | 7 | 41 |
| 4 | 7 | 6 | 6 | 5 | 4 | 28 |
| 5 | 10 | 8 | 8 | 7 | 7 | 40 |
| 6 | 9 | 9 | 6 | 8 | 8 | 40 |
| 7 | 10 | 9 | 9 | 9 | 7 | 44 |
| 8 | 9 | 9 | 9 | 8 | 7 | 42 |
| 9 | 9 | 6 | 7 | 8 | 6 | 36 |
| 10 | 9 | 6 | 6 | 9 | 7 | 37 |
| 11 | 10 | 10 | 9 | 9 | 7 | 45 |
| 12 | 10 | 10 | 8 | 9 | 9 | 46 |
| 13 | 7 | 10 | 8 | 8 | 8 | 41 |
| 14 | 6 | 9 | 7 | 7 | 6 | 35 |
| 15 | 9 | 8 | 8 | 7 | 6 | 38 |
| Total | 135 | 126 | 114 | 118 | 105 | 598 |

RETARDED - NON-SOCIAL REINFORCEMENT GROUP

| Subject Number | Interstimulus Interval 0.5 | 1.0 | 2.0 | 3.0 | 5.0 | Total |
|---|---|---|---|---|---|---|
| 1 | 9 | 8 | 10 | 10 | 7 | 44 |
| 2 | 8 | 9 | 6 | 10 | 8 | 41 |
| 3 | 8 | 7 | 8 | 10 | 9 | 42 |
| 4 | 9 | 9 | 9 | 8 | 7 | 42 |
| 5 | 9 | 6 | 7 | 5 | 4 | 31 |
| 6 | 6 | 7 | 10 | 5 | 6 | 34 |
| 7 | 9 | 8 | 6 | 5 | 8 | 36 |
| 8 | 9 | 8 | 8 | 8 | 8 | 41 |
| 9 | 8 | 8 | 4 | 7 | 7 | 34 |
| 10 | 9 | 10 | 9 | 9 | 8 | 45 |
| 11 | 9 | 9 | 5 | 6 | 7 | 36 |
| 12 | 8 | 7 | 4 | 6 | 5 | 30 |
| 13 | 7 | 6 | 5 | 5 | 5 | 28 |
| 14 | 9 | 8 | 10 | 9 | 7 | 43 |
| 15 | 8 | 10 | 7 | 6 | 8 | 39 |
| Total | 125 | 120 | 108 | 109 | 104 | 566 |

NORMAL - NO REINFORCEMENT GROUP

| Subject Number | Interstimulus Interval 0.5 | 1.0 | 2.0 | 3.0 | 5.0 | Total |
|---|---|---|---|---|---|---|
| 1 | 8 | 7 | 5 | 5 | 4 | 29 |
| 2 | 10 | 8 | 7 | 8 | 8 | 41 |
| 3 | 7 | 8 | 5 | 7 | 4 | 31 |
| 4 | 9 | 7 | 4 | 5 | 4 | 29 |
| 5 | 8 | 5 | 5 | 4 | 6 | 28 |
| 6 | 7 | 7 | 8 | 7 | 8 | 37 |
| 7 | 7 | 6 | 7 | 6 | 8 | 34 |
| 8 | 10 | 5 | 7 | 8 | 5 | 35 |
| 9 | 9 | 8 | 8 | 7 | 7 | 39 |
| 10 | 7 | 9 | 7 | 9 | 5 | 37 |
| 11 | 8 | 7 | 8 | 7 | 5 | 35 |
| 12 | 9 | 9 | 9 | 9 | 7 | 43 |
| 13 | 10 | 9 | 7 | 7 | 6 | 39 |
| 14 | 7 | 7 | 6 | 8 | 7 | 35 |
| 15 | 9 | 10 | 8 | 8 | 8 | 43 |
| Total | 125 | 112 | 101 | 105 | 92 | 535 |

NORMAL - SOCIAL REINFORCEMENT GROUP

| Subject Number | Interstimulus Interval 0.5 | 1.0 | 2.0 | 3.0 | 5.0 | Total |
|---|---|---|---|---|---|---|
| 1 | 8 | 6 | 7 | 6 | 8 | 35 |
| 2 | 8 | 7 | 8 | 7 | 8 | 38 |
| 3 | 9 | 9 | 10 | 7 | 8 | 43 |
| 4 | 6 | 5 | 4 | 4 | 4 | 23 |
| 5 | 10 | 8 | 7 | 5 | 5 | 35 |
| 6 | 5 | 8 | 8 | 3 | 5 | 29 |
| 7 | 9 | 8 | 9 | 8 | 9 | 43 |
| 8 | 9 | 9 | 6 | 4 | 10 | 38 |
| 9 | 5 | 7 | 8 | 8 | 5 | 33 |
| 10 | 10 | 8 | 9 | 8 | 7 | 42 |
| 11 | 7 | 7 | 8 | 7 | 8 | 37 |
| 12 | 10 | 10 | 8 | 9 | 9 | 46 |
| 13 | 7 | 7 | 7 | 6 | 7 | 34 |
| 14 | 10 | 9 | 7 | 6 | 6 | 38 |
| 15 | 10 | 9 | 6 | 7 | 8 | 40 |
| Total | 123 | 117 | 112 | 95 | 107 | 554 |

NORMAL - NON-SOCIAL REINFORCEMENT GROUP

| Subject Number | Interstimulus Interval 0.5 | 1.0 | 2.0 | 3.0 | 5.0 | Total |
|---|---|---|---|---|---|---|
| 1 | 7 | 6 | 8 | 6 | 7 | 34 |
| 2 | 7 | 5 | 5 | 6 | 7 | 30 |
| 3 | 10 | 9 | 9 | 7 | 9 | 44 |
| 4 | 9 | 7 | 10 | 7 | 7 | 40 |
| 5 | 9 | 9 | 9 | 9 | 6 | 42 |
| 6 | 9 | 6 | 6 | 8 | 7 | 36 |
| 7 | 10 | 7 | 9 | 4 | 5 | 35 |
| 8 | 9 | 9 | 8 | 8 | 8 | 42 |
| 9 | 10 | 10 | 7 | 8 | 5 | 40 |
| 10 | 6 | 6 | 7 | 6 | 8 | 33 |
| 11 | 10 | 10 | 9 | 9 | 6 | 44 |
| 12 | 8 | 5 | 5 | 7 | 7 | 32 |
| 13 | 9 | 8 | 8 | 10 | 7 | 42 |
| 14 | 10 | 9 | 9 | 9 | 7 | 44 |
| 15 | 5 | 5 | 5 | 5 | 5 | 25 |
| Total | 128 | 111 | 114 | 109 | 101 | 563 |

## APPENDIX D

## Appended Tables

TABLE 3

Summary of the Analysis of Variance for the Number of Correct Responses for the Straight Line Sequences by Groups, by Reinforcement Condition Over Interstimulus Intervals

| Source of Variation | Sums of Squares | d.f. | Mean Squares | F | P |
|---|---|---|---|---|---|
| Between Subjects | 312.72 | 89 | | | |
| A (Groups) | 1.28 | 1 | 1.28 | .3738 | |
| B (Reinforcement Conditions) | 12.2133 | 2 | 6.1067 | 1.7833 | |
| AB | 11.5734 | 2 | 5.7867 | 1.6898 | |
| Ss w. groups (error between) | 287.6533 | 84 | 3.4244 | | |
| Within Subjects | 464.4078 | 360 | | | |
| C (Interstimulus Intervals) | 98.6089 | 4 | 24.6522 | 23.9342 | $p < .001$ |
| AC | 3.1500 | 4 | .7875 | .7646 | |
| BC | 5.5645 | 8 | .6956 | .6753 | |
| ABC | 10.3377 | 8 | 1.2922 | 1.2546 | |
| C x Ss w. groups (error within) | 346.7467 | 336 | 1.03 | | |

TABLE 4

Summary of the Analysis of Variance for the Number of Correct Responses for the Crooked Line Sequences by Groups, by Reinforcement Conditions Over Interstimulus Intervals

| Source of Variation | Sums of Squares | d.f. | Mean Squares | F | P |
|---|---|---|---|---|---|
| Between Subjects | 196.23 | 89 | | | |
| A (Groups) | 1.28 | 1 | 1.28 | .5923 | |
| B (Reinforcement Conditions) | 6.80 | 2 | 3.40 | 1.5733 | |
| AB | 6.66 | 2 | 3.33 | 1.5409 | |
| Ss w. groups (error between) | 181.49 | 84 | 2.16 | | |
| Within Subjects | 164.00 | 360 | | | |
| C (Interstimulus Intervals) | 5.10 | 4 | 1.275 | 2.8487 | $p < .05$ |
| AC | 2.29 | 4 | .573 | 1.279 | |
| BC | 2.20 | 8 | .275 | .6144 | |
| ABC | 4.03 | 8 | .504 | 1.1255 | |
| C x Ss w. groups (error within) | 150.38 | 336 | | | |

TABLE 6

The Two Factor Index of Social

Position Group Data

| Groups | | Social Class | | | | |
|---|---|---|---|---|---|---|
| | | I | II | III | IV | V |
| Normal | No Reinforcement | o | 2 | 6 | 2 | 0 |
| | Social Reinforcement | 0 | 4 | 6 | 3 | 0 |
| | Non-Social Reinforcement | 2 | 3 | 3 | 3 | 1 |
| Retarded | No Reinforcement | 0 | 0 | 0 | 2 | 12 |
| | Social Reinforcement | 0 | 0 | 0 | 0 | 13 |
| | Non-Social Reinforcement | 0 | 0 | 0 | 1 | 11 |

TABLE 7

Percentage Correct Responses Over Each Interstimulus Interval for the Holden (1967) Multiple Line Condition Groups and the No Reinforcement Groups in the Present Study

| Interstimulus Interval | | 0.5 | 1.0 | 2.0 | 3.0 | 5.0 |
|---|---|---|---|---|---|---|
| Retardates | Holden (1967) | 76.50 | 64.00 | 50.00 | 29.40 | 27.00 |
| | Present Study | 73.33 | 78.67 | 70.00 | 67.33 | 66.00 |
| Normals | Holden (1967) | 66.30 | 64.00 | 59.40 | 41.70 | 40.80 |
| | Present Study | 81.25 | 74.67 | 67.33 | 70.00 | 61.33 |

TABLE 8

Experimental Task - Target Test Score Correlations

for Each Experimental Group

(Pearson Product Moment)

| Reinforcement Conditions | Groups | |
|---|---|---|
| | Normal | Retarded |
| No Reinforcement | .464 | - .445 |
| Social Reinforcement | .069 | - .276 |
| Non-Social Reinforcement | - .333 | .338 |

TABLE 9

Summary of the Analysis of Variance for the Number of Correct Responses for Reinforcement Conditions Over Interstimulus Intervals for the Retarded Subjects

| Source of Variation | Sums of Squares | d.f. | Mean Squares | F | P |
|---|---|---|---|---|---|
| Between Subjects | 257.0489 | 44 | | | |
| A (Reinforcement Conditions) | 28.1689 | 2 | 14.0844 | 2.5845 | $p < .10$ |
| Ss w. groups (error between) | 228.8800 | 42 | 5.4495 | | |
| Within Subjects | 298.8000 | 180 | | | |
| B (Interstimulus Intervals) | 62.4711 | 4 | 15.6178 | 11.5457 | $p < .001$ |
| AB | 9.0756 | 8 | 1.1345 | .8549 | |
| B x Ss w. groups (error within) | 227.2533 | 168 | 1.3527 | | |

TABLE 10

Percentage Correct Responses for the Straight Line Presentations Over Each Interstimulus Interval for the Holden (1967) Multiple Line Condition Groups and the No Reinforcement Groups in the Present Study

| Interstimulus Interval | | 0.5 | 1.0 | 2.0 | 3.0 | 5.0 |
|---|---|---|---|---|---|---|
| Retardates | Holden (1967) | 76.50 | 64.00 | 50.00 | 29.40 | 27.00 |
| | Present Study | 66.67 | 74.67 | 58.67 | 52.00 | 49.33 |
| Normals | Holden (1967) | 66.30 | 64.00 | 59.40 | 41.70 | 40.80 |
| | Present Study | 73.33 | 61.33 | 56.00 | 53.33 | 38.67 |

## APPENDIX E

## Appended Figures

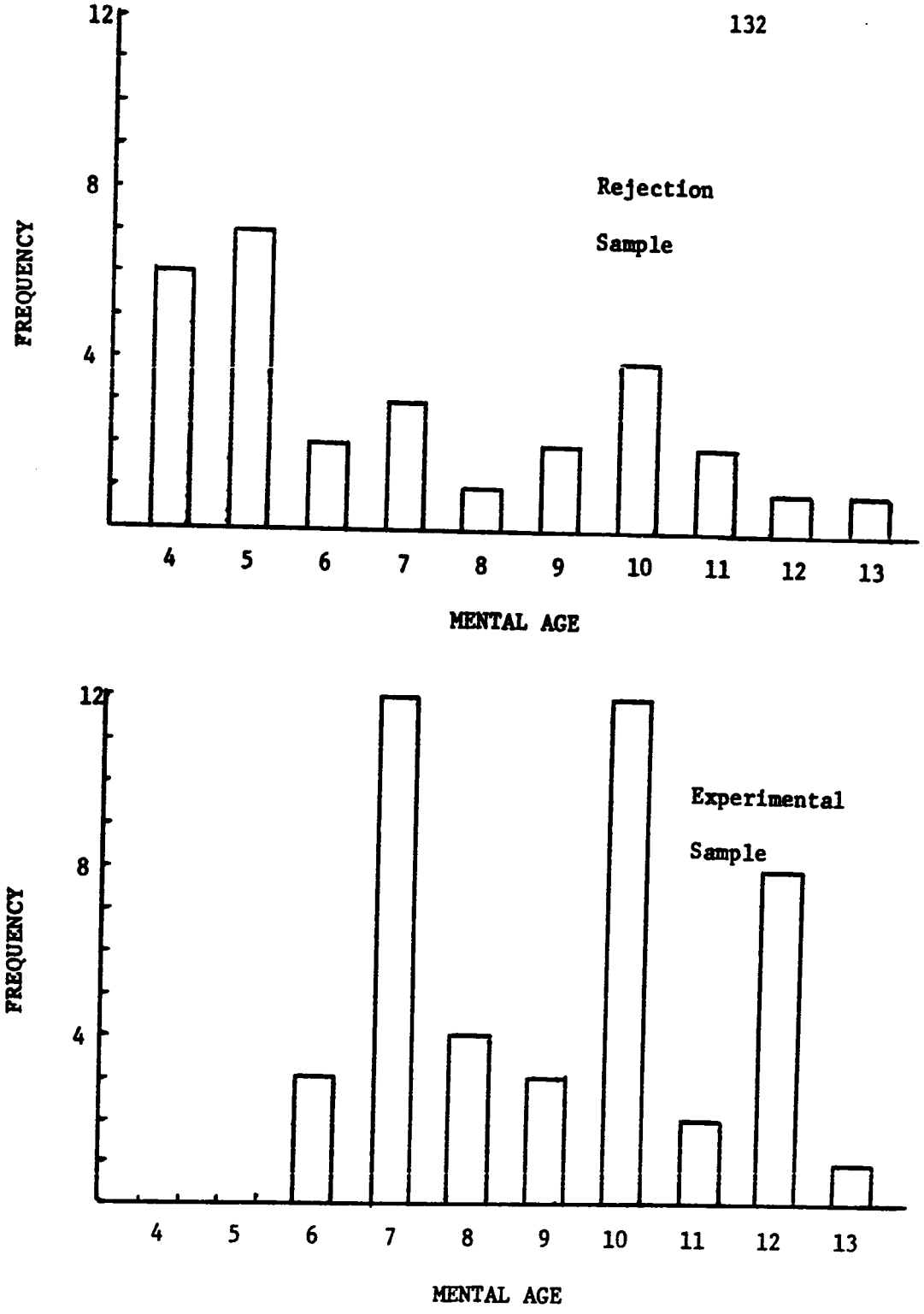



Figure 2. Frequency histograms for the retardate experimental sample (N = 45) and the retardate rejection sample (N = 29) over each mental age found in the retardate subject pool (N = 74).